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WHITE PINE BLISTER RUST CONTROL

NORTHWESTERN PROJECT

January 1 to December 31, 1952

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WHITE PINE BLISTER RUST CONTROL - NORTHWESTERN PROJECT, 1952
Herman E. Swanson, Project Leader

Problems and Objectives

White pine blister rust has imposed a severe burden on the forest industry of the Inland Empire. Since blister rust appeared in the region in 1923, it has caused havoc in unprotected young stands, literally wiping out seedling size white pine. Loss of mature trees is taking place where ribes, the alternate host of the disease, have been present in large numbers.

Ribes eradication for the control of blister rust on the entire 3.6 million acres of the commercial white pine area in the Inland Empire and on the several hundred thousand acres in the National Parks was deemed economically unfeasible in 1934 when the first specific selections of 2.7 million acres were made. Reappraisals of the situation have been made subsequently designating priorities among the white pine units warranting the cost of control. At the present time, 1,916,840 acres of white pine of all age classes are retained in the control area. The Inland Empire control area comprises 1,888,000 acres including 300,000 acres of mature stands on which no control work or logging are contemplated until after 20 years. Units comprising 938,000 acres are being protected under the present program, assuming the present level of field operations until 1969. The balance of 650,000 acres in the Inland Empire control area cannot be protected without increasing the control program.

Within the National Parks, areas selected for control total 28,840 acres. The present program is adequate to handle these areas. Work is being reduced to a maintenance operation on many portions of the area. If no further additions are made to the control area, the entire operation should be on maintenance in a few years.

Values

Future white pine yield at rotation age (120 years) on the commercial white pine type of 1,888,000 acres is estimated at 36.5 billion board feet which at the present stumpage price of \$28 per M is valued at \$1,022,000,000. However, 20.5 billion board feet valued at \$574,000,000 is the estimate on the 938,000 acres included under the present control program.

Cooperation

Cooperating in the blister rust control program are the Bureau of Entomology and Plant Quarantine, having responsibility for the leadership and technical direction of the program as provided in the memoranda of agreements with the other cooperating agencies; the United States Forest Service; the National Park Service; the State of Idaho (Montana and Washington cooperate in the enforcement of quarantines, but have no control program); and the Clearwater, Potlatch, and Priest Lake Timber Protective Associations in north Idaho.

Control work on National Forest lands and National Park lands is financed by federal funds appropriated to the U. S. Forest Service and National Park Service. On state and private lands (including intermingled federal lands) in Idaho, the

work is financed by federal funds appropriated to the Bureau of Entomology and Plant Quarantine, state funds appropriated by the State of Idaho, and private and state funds raised by the three timber protective associations through a 2-cent per acre annual assessment on the membership acreage. The associations increased the assessment to 3 cents per acre in fiscal year 1953 which increased the amount to \$24,471.

Status of Program

The present status of the program is illustrated in the accompanying chart. Past control work has protected young white pine growth representing a potential of 6 to 8 billion board feet at maturity with a value of \$168 to \$224 million.

Accomplishments in 1952

Progress in 1952 for the amount of funds available was very satisfactory and represented a great improvement over the somewhat disappointing results of the 1951 season. Several factors contributed to the improvement. Most important was the critical analysis made of all phases of field activities, including labor recruitment, training, methods of ribes eradication, coordination of ribes eradication with checking, and employee relations. No outstanding new ideas were developed in this analysis, but it did point to the necessity of giving close attention to details in following recommended procedures and in applying and using the proper methods and equipment for accomplishing the job. Also contributing directly to the greater accomplishments were: (1) good workers, secured through added recruitment efforts; (2) favorable weather and no serious interruptions for suppressing forest fires; (3) new federal leave law provided sufficient inducement for many seasonal employees to remain 90 days or longer making labor turnover much less than in previous years.

Field program for ribes eradication:

<u>Agencies</u>	<u>Camps</u>	<u>Workers</u>
Bureau of Entomology and Plant Quarantine (State of Idaho, Clearwater, Potlatch, and Priest Lake Timber Protective Associations as cooperators)	7	230
U. S. Forest Service	29	1,134
National Park Service	6	106
Total	42	1,470

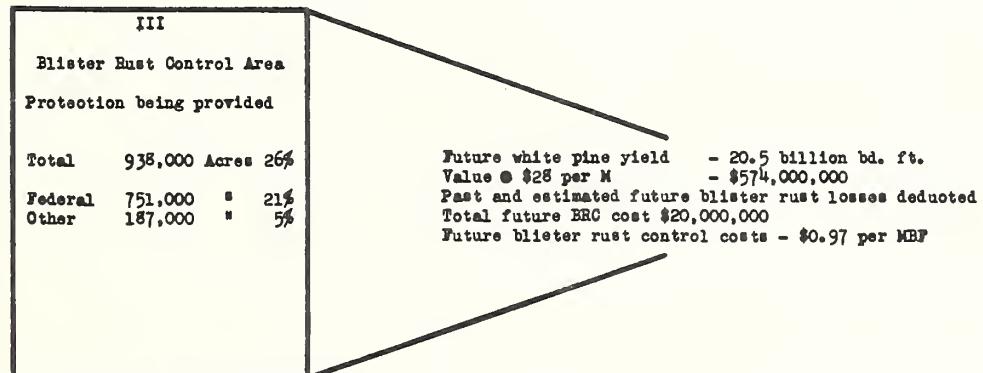
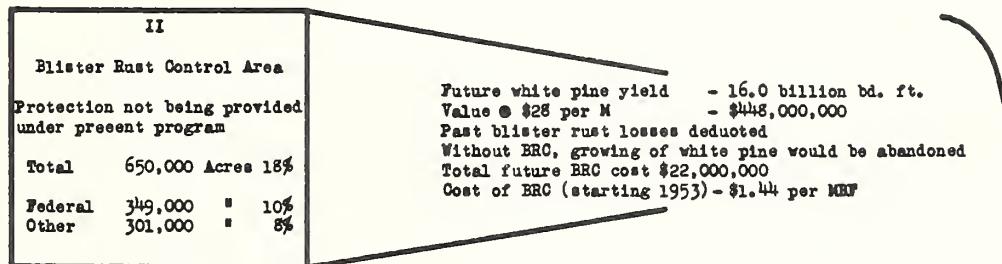
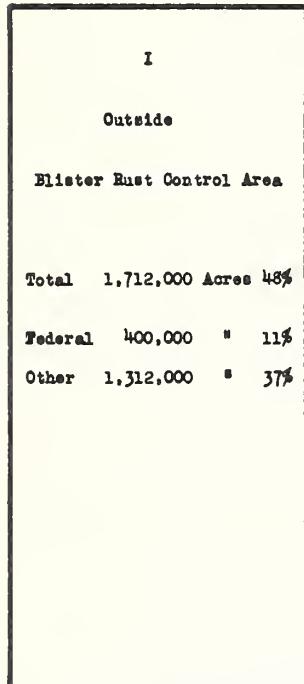
Progress in 1952 on ribes eradication:

<u>Agency</u>	<u>Initial Acres</u>	<u>Rework Acres</u>	<u>Total Acres</u>	<u>Total Man- Days</u>	<u>Destroyed Ribes</u>	<u>Per Acre Man- Days</u>	<u>Ribes</u>
Bureau of Entomology and Plant Quarantine	2,140	6,370	8,510	8,090	1,246,100	.95	146
Forest Service	6,750	34,750	41,500	42,810	1,651,600	1.03	40
National Park Service	400	3,990	4,390	4,330	520,000	.99	118
Total	9,290	45,110	54,400	55,230	3,417,700	1.02	63

INLAND EMPIRE WHITE PINE LANDS
Blister Rust Control

Total White Pine Lands

Total	3,600,000 Acres	100%
Federal	1,500,000	50%
State	400,000	11%
Other	1,400,000	39%



Present control area

Total	1,888,000 Acres	52%
Federal	1,400,000	39%
Other	488,000	13%

Changes in Operation and Trends

Expansion in the use of chemicals for destroying ribes and the increased interest developing in contract work are the most important trends leading to more efficient ribes eradication at lower costs. The use of chemicals on large areas of heavy ribes populations has become standard practice. In addition, chemical methods are proving advantageous on small ribes patches of not more than an acre occurring within large areas of lower ribes populations. Hand crews are trained to recognize conditions more effectively handled by spraying and they are marking and bypassing such patches for later chemical treatment. Portable back-pack power sprayers and folding canvas mixing tanks are extending the advantages of chemical to very remote areas. Chemical methods not only do the initial job cheaper but reduce the amount of rework required.

Within areas which are to be protected from blister rust, federal, state, and private agencies are attempting to follow timber management practices which minimize the ribes problem and assure adequate white pine stocking. More attention is being given from year to year to this phase of management on state and private holdings. On national forest lands, the Forest Service has been coordinating its blister rust control program with management plans for a number of years.

Federal, state, and private land managing agencies are following with interest the work on rust resistant white pine. The planting of grafts made from scions from rust resistant white pine was continued on the five plantation areas being used for this purpose. Seeds from the controlled pollinations among the rust resistant trees made in 1950 were planted in April 1952, and germination was very high. Some of the seedlings were artificially exposed to blister rust in the fall. First results of this inoculation will not be known until 1953. This subject is fully presented in the "Development of Rust Resistant White Pine" section of the Northwestern Blister Rust Control annual report.

Spread of the Rust

Blister rust infection was found on ribes near the eastern border of Montana and the southern boundary of Wyoming, near Laramie. These extensions represent an eastward spread of 200 miles in Montana and a southeastward spread of 225 miles in Wyoming from previously known occurrences of the disease.

Recommendations

- 1 Additional funds and personnel should be provided the Development and Improvement Project to:
 - a Make more extensive search of potential herbicides for use in ribes eradication and develop and test formulations for field use
 - b Expand disease studies and surveys in pole and mature age classes without detracting from present work on disease studies and development of rust resistant white pine

c. Expand work in testing fungicides for arresting blister rust canker growth in infected trees.

Additional investigative and experimental work in these fields should benefit the blister rust program country-wide. More effective and cheaper chemicals will reduce control costs. Greater knowledge of the damaging power of blister rust in the older age classes of white pine will provide more reliable economic appraisals and sound basis for timber management planning. An economical fungicidal treatment which will stop canker development in infected trees will save high future volumes in trees infected before control was established. Such a treatment in pole size stands outside control areas could arrest development of old rust long enough for the trees to reach loggable size and be harvested.

EXCERPTS FROM OMNIBUS TABLES, 1952

TABLE 1

SUMMARY OF RIBES ERADICATION BY STATES AND OPERATING AGENCIES - 1952

State	Agency	First Working			Second Working			Other Workings			All Workings			Per Acre	
		Acres	Ribes	Man-Days	Acres	Ribes	Man-Days	Acres	Ribes	Man-Days	Acres	Ribes	Man-Days	Ribes	Man-Days
Idaho	BEPQ	2,140	1,158,200	2,010	1,770	31,200	1,840	4,600	56,700	4,240	8,510	1,246,100	8,090	146	.95
	FS	2,700	266,600	4,350	14,320	344,400	12,960	13,810	152,300	14,630	30,830	763,300	31,940	25	1.04
	Total	4,840	1,424,800	6,360	16,090	375,600	14,800	18,410	209,000	18,870	39,340	2,009,400	40,030	51	1.02
Mont.	FS	440	245,000	1,230	1,760	117,000	1,720	2,380	67,300	2,180	4,580	429,300	5,130	94	1.12
	NPS				320	67,000	710	650	4,000	290	970	71,000	1,000	73	1.03
	Total	440	245,000	1,230	2,080	184,000	2,430	3,030	71,300	2,470	5,550	500,300	6,130	90	1.10
Wash.	FS	3,610	341,000	3,060	1,010	65,000	1,360	1,470	53,000	1,320	6,090	459,000	5,740	75	.94
	NPS							610	38,000	670	610	38,000	670	62	1.10
	Total	3,610	341,000	3,060	1,010	65,000	1,360	2,080	91,000	1,990	6,700	497,000	6,410	74	.96
Colo.	NPS				1,600	46,000	1,140				1,600	46,000	1,440	29	.90
Wyo.	NPS	400	348,000	990				810	17,000	230	1,210	365,000	1,220	302	1.01
All States	BEPQ	2,140	1,158,200	2,010	1,770	31,200	1,840	4,600	56,700	4,240	8,510	1,246,100	8,090	146	.95
	FS	6,750	852,600	8,640	17,090	526,400	16,040	17,660	272,600	18,130	41,500	1,651,600	42,810	40	1.03
	NPS	400	348,000	990	1,920	113,000	2,150	2,070	59,000	1,190	4,390	520,000	4,330	118	.99
	Total	9,290	2,358,800	11,640	20,780	670,600	20,030	24,330	388,300	23,560	54,400	3,417,700	55,230	63	1.02

TABLE 2

ACREAGE WORKED BY LAND OWNERSHIP - 1952

Land Ownership	First Working Acres	Second Working Acres	Other Workings Acres	All Workings Acres
National Forest Region 1	5,790	16,270	15,360	37,420
National Park	400	1,920	2,070	4,390
State and Private	3,100	2,590	6,900	12,590
Total	9,290	20,780	24,330	54,400

TABLE 3

SUMMARY OF EXPENDITURES - FEDERAL AND COOPERATIVE - 1952

State	Federal Funds					Cooperative Funds			Total All Funds	
	Entomology and Plant Quarantine		Forest Service	Park Service	Total Federal Funds	Direct Aid	Indirect Aid	Total (Direct and Indirect Aid)		
	W-a.W	W-e.W								
Idaho	\$ 92,492	\$119,031	\$ 825,706		\$1,037,229	\$53,237	\$2,000	\$55,237	\$1,092,466	
Montana	18,500		147,594	\$24,297	190,391		1,000	1,000	191,391	
Washington	17,000		145,316	14,120	176,436		1,000	1,000	177,436	
Colorado	5,000			26,304	31,304				31,304	
Wyoming	5,000			30,446	35,446				35,446	
Total	\$137,992	\$119,031	\$1,118,616	\$95,167	\$1,470,806	\$53,237	\$4,000	\$57,237	\$1,528,043	

COOPERATIVE BLISTER RUST CONTROL ON STATE AND PRIVATE LANDS

Herman E. Swanson, Project Leader

Calendar Year 1952

The analysis made of the white pine units of predominately state and private lands which are retained in the present control area was set forth in the 1951 report. The data included acreages by class of ownership, estimates of future yields of white pine and future blister rust control costs. Units being handled under the present control program contained 188,230 acres, with an additional 284,770 acres of high value units warranting the cost of control but being outside the present control program. The following compilations have been made which show the progress of control on these units:

<u>Area</u>	<u>Total</u>	<u>First Working</u>	<u>Second Working</u>	<u>Other Workings</u>	Maint. and
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Def. Mature</u>
Units in present control program					
Clearwater	54,230	46,640	21,710	9,110	14,830
St. Joe	76,000	62,000	36,000	10,000	31,000
Kaniksu	58,000	50,000	25,000	9,000	27,000
Subtotal	188,230	158,640	82,710	28,110	72,830
High value units (repro. and pole) outside present control program					
Clearwater	27,750	10,400	3,230	40	4,830
St. Joe	68,000	30,000	5,000	200	14,000
Subtotal	95,750	40,400	8,230	240	18,830
High value units (mature) outside present control program					
Clearwater	82,020	40,150	4,360	770	51,650
St. Joe	107,000	23,000			91,000
Subtotal	189,020	63,150	4,360	770	142,650
Grand totals representing present control area					
Clearwater	164,000	97,190	29,300	9,920	71,310
St. Joe	251,000	115,000	41,000	10,200	136,000
Kaniksu	58,000	50,000	25,000	9,000	27,000
Total	473,000	262,190	95,300	29,120	234,310

Changes in the above tabulations for the acreage in or outside the control program may be required from year to year. Ownership changes may cause a shift of a unit between the Bureau cooperative program on state and private lands and the Forest Service program on national forest lands. Also, more effective ribes eradication methods are reducing costs sufficiently to permit the inclusion of additional acreage in the control program at some future date, provided the present level of field operations is maintained. No significant amount of acreage can be added immediately without an increase in the size of the program. While some units outside the present program will be brought into it later, other outside units will be dropped from further consideration as the rust destroys the young crops of white pine.

Continued interest and cooperation is being received on the blister rust control program from the various forest land managing agencies in Idaho. The Clearwater, Potlatch, and Priest Lake Timber Protective Associations each increased their blister rust control assessments from 2 to 3 cents per acre,

an increase of \$8,200 per year in the contributions. Cutting practices in most instances are assuring adequate white pine reproduction on logged areas within the control area. Operators are also giving attention to practices which will make the control problem less difficult.

Reports on the cooperative work on the Clearwater, Potlatch, and Priest Lake Timber Protective Associations are included with the Clearwater, St. Joe, and Kaniksu Area reports. A summary of the 1952 program is presented below:

1. Allotments:

<u>Agency</u>	<u>Fiscal Year 1952</u>	<u>Fiscal Year 1953*</u>
Federal (EPQ)	\$108,809.47	\$103,000.00
State of Idaho	30,000.00	30,000.00
Clearwater T.P.A.	6,894.08	10,342.00
Potlatch T.P.A.	5,515.54	8,273.00
Priest Lake T.P.A.	4,191.30	6,287.00
Potlatch Forests, Inc.	<u>3,210.00</u>	
Total	\$158,620.39	\$157,902.00

*Approximate

2. Cooperative Field Program and Expenditures - Calendar Year 1952

<u>Area</u>	<u>Camps</u>	<u>Workers</u>	<u>Contracts</u>	<u>Expenditures</u>
Clearwater	3	95	8	\$ 69,549.00
Potlatch	2	100		67,545.00
Priest Lake	2	<u>35</u>	<u>2</u>	<u>35,174.00</u>
Total	7	230	10	\$172,268.00

3. Ribes Eradication - Cooperative Program - 1952

<u>Area</u>	<u>Initial Work Acres</u>	<u>Rework Acres</u>	<u>Total Worked Acres</u>	<u>Man-Days</u>	<u>Per Acre</u>	
					<u>Man-Days</u>	<u>Ribes</u>
Clearwater	1,100	2,300	3,400	2,980	119,100	.88
Potlatch	1,040	1,840	2,880	3,430	1,102,000	1.19
Priest Lake		<u>2,230</u>	<u>2,230</u>	<u>1,680</u>	<u>25,000</u>	<u>.75</u>
Total	2,140	6,370	8,510	8,090	1,246,100	.95
						146

4. State and Private Lands Worked in 1952

<u>State</u>	<u>First Working Acres</u>	<u>Second Working Acres</u>	<u>Other Workings Acres</u>	<u>Total Worked Acres</u>
Idaho	2,720	2,520	6,900	12,140
Washington	<u>380</u>	<u>70</u>	<u>—</u>	<u>450</u>
Total	3,100	2,590	6,900	12,590

5. Summary of Expenditures from State and Private Funds in Idaho

<u>Calendar Years</u>	<u>State</u>	<u>Private and T.P. Assns.</u>	<u>Total</u>
1928-1949	\$263,498.81	\$215,222.91	\$478,721.72
1950	24,141.65	16,246.66	40,388.31
1951	21,990.11	16,314.28	38,304.39
1952	<u>33,425.93</u>	<u>19,810.92</u>	<u>53,236.85</u>
Total	\$343,056.50	\$267,594.77	\$610,651.27

NATIONAL FOREST OPERATIONS
Calendar Year 1952
G. M. DeJarnette, Forester
Blister Rust Control, U.S.F.S., Region One

The 1952 National Forest operations continued on about the same scale as for the past several years. Labor ran about the same as to age, class, and overall supply. The increase in federal income tax allowance for dependents earning from \$500 to \$600 was partly offset by an increase in wages, but it helped to keep a few more boys on the job for a little longer period.

The use of chemicals continued to increase. The heavy ester type of 2,4,5-T has proven very satisfactory. Two new Bean Royal spray units were purchased and placed in operation. Power spraying has really come into its own in the regional program. In areas accessible by road, the orchard type tankers are paying out well. In areas accessible by jeep trail or pack trail, the smaller portable units are being used. A considerable amount of road work can be justified for the spraying of larger areas of heavy work. Back-pack outfits and Hi-Fog guns replaced handwork on some operations to a greater extent than ever before.

It is increasingly apparent that the successful use of chemicals depends on the proper application more than on the exact formulation, or even the potency of the chemical. In other words, even the most potent dosage of 2,4-D or 2,4,5-T will not kill unless the application is thorough and complete. I have noted that in nearly every case of poor results the cause can be traced to careless application or to over-rating the killing power of the chemical when applied to only portions of the plant. Much of the discouragement and criticism of both the chemical and spray equipment are due to misuse of the chemical or equipment, or both. We must recognize the fact that the chemical eradication of ribes is a highly specialized phase of the project. It requires well trained and well supervised personnel. We must also realize that no one piece of equipment will serve all spray needs. Each one needs to be tried and proven or disproven. Thereafter, it should be used in the situations to which it is adapted. I believe it has been proven very conclusively that the proper use of chemical will greatly reduce the manpower requirements and increase the effectiveness of control effort. The use of chemical should be greatly increased. However, no one should be discouraged because a single application doesn't result in a magical disappearance of all ribes on the area treated. Neither the chemicals nor the methods of application are that good as yet. It seems unlikely that they ever will be, although constant improvement is being made in both.

No helicopter work was done because there was no helicopter available this past season. Helicopter spraying done in 1951 was re-examined. The results of double spraying on the Packsack area, Coeur d'Alene National Forest and the Kalispell Creek areas on the Kaniksu look very encouraging. No live ribes were found on the Packsack area except in thickets of lodgepole pine or other reproduction where they were well screened. The Ceanothus brush and willow were killed to the extent of 50 to 75 percent. Final cleanup of ribes on this area will be a simple and inexpensive job.

Trial of fixed wing spraying for plantation release and planting preparation indicated that better results can be obtained with fixed wing aircraft when snags or rough terrain require flying at 100 to 200 feet above the ground than with the helicopter at these elevations. Where low level flying can be done (25 to 50 feet above the ground) the "copter" is believed to be more effective and costs about \$2 per acre less than the Ford trimotor jobs done this year. However, exact cost comparisons are not possible because ferrying distances and distance from operating base vary so greatly.

Contracting showed an increase on two forests and seemed to offer less trouble due to inexperienced contractors and other troubles, than for several years past.

The fire season was very light until after the blister rust season was over. There was almost no loss of time due to fire. All primary unit analysis work is now complete. The units which will comprise the full first period work area have been set up in priority order. These include the present stand units which still have value worth protecting, but for the most part they will be mature units which will come into the picture through cutting or rehabilitation - units which will replace the present stand units lost to the rust because of insufficient manpower and money to protect them.

As the grouping of units now stands, it will be possible to correlate cutting plans, planting plans, and control plans much more satisfactorily than ever before.

The expenditures and progress in blister rust control by the U. S. Forest Service during 1952 are summarized below:

1. Field Program and Expenditures - Calendar Year 1952

<u>Forest</u>	<u>Camps</u>	<u>Workers</u>	<u>Contracts</u>	<u>Expenditures</u>
Clearwater	3	119		\$ 119,496
St. Joe	9	435	13	392,992
Coeur d'Alene	5	160	28	184,352
Kaniksu	7	275	14	274,182
Cabinet	3	95		101,048
Kootenai	2	50		46,546
Total	29	1,134	55	\$1,118,616

2. Ribes Eradication by Forest Service Crews - 1952

<u>Forest</u>	Initial Work			Total Worked		Per Acre		
	<u>Acres</u>	<u>Rework</u>	<u>Acres</u>	<u>Acres</u>	<u>Man-Days</u>	<u>Ribes</u>	<u>Days</u>	<u>Ribes</u>
Clearwater	180	4,150	4,330	3,460	180,300	.80	42	
St. Joe	1,030	13,370	14,400	16,930	291,100	1.18	20	
Coeur d'Alene	770	4,650	5,420	6,450	182,900	1.19	34	
Kaniksu	4,330	8,440	12,770	10,840	568,000	.85	44	
Cabinet	230	2,300	2,530	3,480	326,000	1.38	129	
Kootenai	210	1,840	2,050	1,650	103,300	.80	50	
Total	6,750	34,750	41,500	42,810	1,651,600	1.03	40	

BLISTER RUST CONTROL ON NATIONAL PARKS

Herman E. Swanson, Project Leader

Calendar Year 1952

Reports covering blister rust control in Mount Rainier, Glacier, Yellowstone, and Rocky Mountain National Parks show the work to be progressing efficiently and on schedule. The present program is adequate to handle the selected control areas of 28,840 acres. The requirements for maintaining control on the areas where ribes eradication was started in the early years of the program are becoming quite small. The excellent results from chemical methods now in use indicate that control will be established more rapidly on the later additions to the control area.

In view of the spread of the rust as far as Laramie, Wyoming, the timeliness of the control work in Yellowstone and Rocky Mountain National Parks is apparent. To date only two blister rust infected white pine have been found in Yellowstone although heavy pine infection has been found in several places north of the Park. While two more years are planned for completing initial ribes eradication on the addition to the Mount Washburn area, the major job of ribes elimination on the selected control areas has been completed. In Rocky Mountain the situation is even more favorable with initial ribes eradication completed and known white pine blister rust on ribes only as near as Laramie.

Expenditures and progress of control work are presented in the following summaries:

1. Expenditures by National Park Service

<u>National Park</u>	<u>Calendar Year 1952</u>	<u>All Years</u>
Mount Rainier	\$14,120	\$169,570
Glacier	24,297	172,936
Yellowstone	30,446	206,173
Rocky Mountain	<u>26,304</u>	<u>100,350</u>
Total	\$95,167	\$649,029

2. Ribes Eradication in 1952

<u>National Park</u>	<u>First Working Acres</u>	<u>Second Working Acres</u>	<u>Other Workings Acres</u>	<u>Total Worked Acres</u>	<u>Man-Days</u>	<u>Ribes</u>	<u>Per Acre Man-Days</u>	<u>Ribes</u>
Mount Rainier			610	610	670	38,000	1.10	62
Glacier		320	650	970	1,000	71,000	1.03	73
Yellowstone	400		810	1,210	1,220	365,000	1.01	302
Rocky Mountain	—	1,600	—	1,600	1,440	46,000	.90	29
Total	400	1,920	2,070	4,390	4,330	520,000	.99	118

3. Gross Acreage Worked 1930-1952

National Park	First Working Acres	Second Working Acres	Other Workings Acres	Total Worked Acres	Man- Days	Ribes	Per Acre Man- Days	Ribes
Mount Rainier	8,270	4,690	12,040	25,000	26,170	2,500,000	1.05	100
Glacier	5,140	3,940	4,160	13,240	14,430	1,379,000	1.09	104
Yellowstone	9,990	3,140	1,020	14,150	11,720	1,785,000	.83	126
Rocky Mountain	6,100	1,730	—	7,830	5,660	364,000	.72	46
Total	29,500	13,500	17,220	60,220	57,980	6,029,000	.96	100

4. Status on Present Control Area

National Park	First Working Acres	Second Working Acres	Other Workings Acres	Maintenance Acres	Unworked Acres	Control Area Acres
Mount Rainier	4,500	4,300	11,830	3,410	—	4,500
Glacier	5,140	3,940	4,160	3,560	—	5,140
Yellowstone	9,990	3,140	1,020	6,940	3,110	13,100
Rocky Mountain	6,100	1,730	—	3,780	—	6,100
Total	25,730	13,110	17,010	17,690	3,110	28,840

SPREAD OF WHITE PINE BLISTER RUST

SCOUTING IN MONTANA, WYOMING, IDAHO, AND COLORADO, 1952
By
J. C. Gynn and C. M. Chapman

Infection centers of white pine blister rust (Cronartium ribicola) found in 1952 indicate the disease has now spread to the eastern boarder of Montana and to the southern boundary of Wyoming. Blister rust on white pine was found for the first time in Carbon County, Montana, east of Yellowstone National Park. The disease on ribes was found for the first time in McCone, Prairie, and Carbon Counties, Montana, and Albany County, Wyoming. From previously known limits of the disease, this represents an eastward spread of nearly 200 miles in Montana and a south-easterly advancement of over 225 miles in Wyoming.

WHITE PINE INFECTED LOCATION

Carbon County, Montana, adjacent to Custer National Forest, Rock Creek drainage, 3 miles southwest of Redlodge, Montana, T. 8 S., R. 20 E., sec. 3. The host Pinus flexilis was infected with pycnia stage canker in 1945 wood, probably of 1948 origin.

RIBES INFECTED LOCATIONS

1. McCone County, Montana, north of Custer National Forest, Big Dry Creek drainage, 11 miles west of Brockway, T. 18 N., R. 45 W., sec. 14. The infected host was Ribes cereum.
2. Prairie County, Montana, north of Custer National Forest, Redwater River drainage, 17 miles south of Brockway, T. 15 N., R. 47 E., sec. 12. The infected host was R. americanum and R. setosum.
3. Carbon County, Montana, adjacent to Custer National Forest, Rock Creek drainage, 3 miles southwest of Redlodge, T. 8 S., R. 20 E., sec. 3. The infected host was R. setosum.
4. Albany County, Wyoming, Medicine Bow National Forest, Pole Mountain District, 12 miles east of Laramie, T. 15 N., R. 72 W., sec. 35. The infected host was R. setosum.

All other infection found in 1952 was in the vicinity of previously reported infection.

No white pine blister rust has been found in Colorado up to December 1952.

Pinyon rust was found in the following counties in 1952: McCone County, Montana; Carbon, Teton, and Lincoln Counties, Wyoming; Bear Lake, and Lincoln Counties, Idaho; and Moffat County, Colorado.

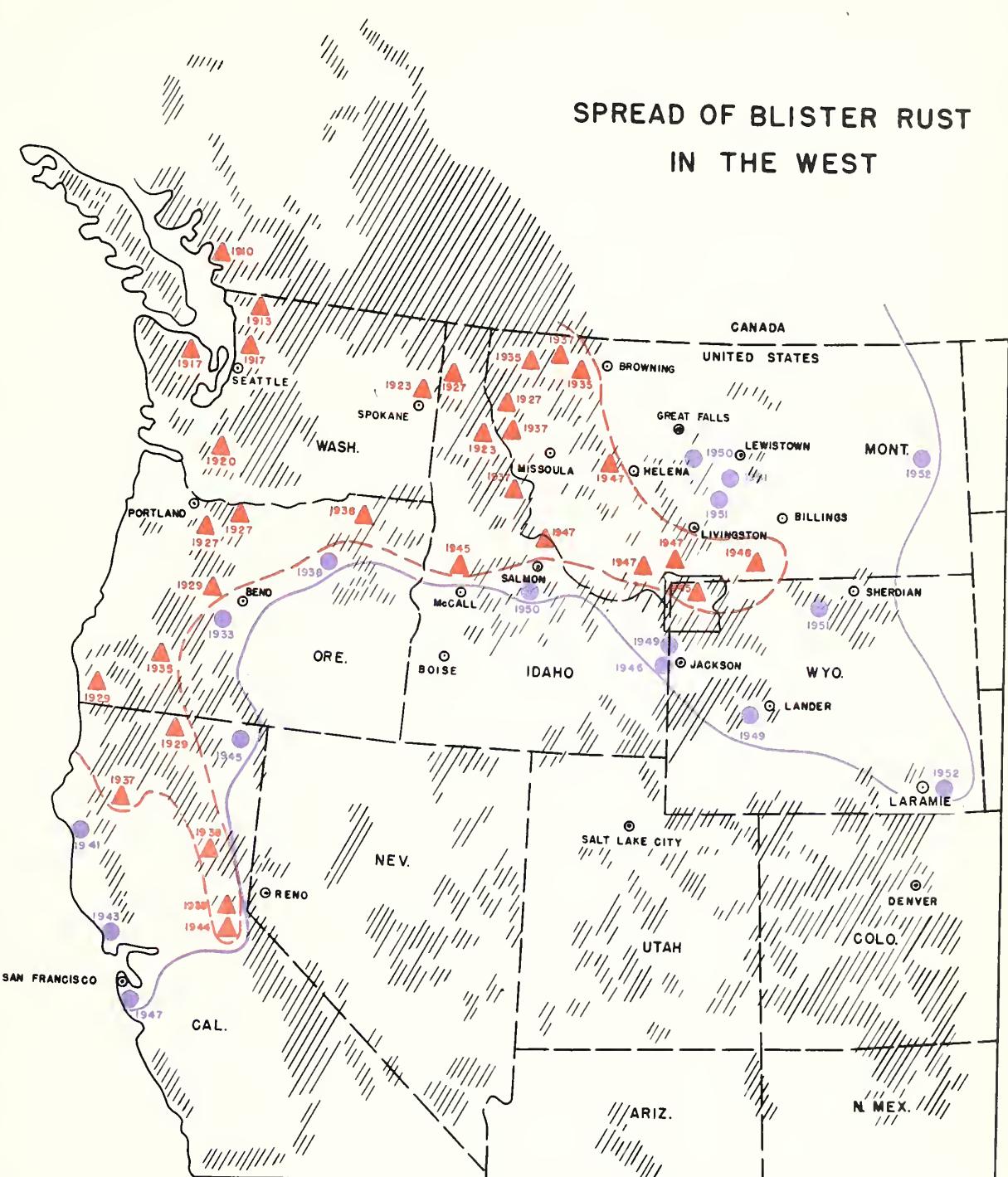
Ribes species infected with pinyon rust were R. aureum and R. setosum.

SCOUTING SUMMARY, 1952
MONTANA, WYOMING, IDAHO, COLORADO

Forest Unit	Drainages Sampled	Ribes Examined	Pine Examined	New Infection Centers	
				Ribes	Pine
Lewis and Clark N. F., Mont.	1	41	60		
*Custer N. F., Mont.	3	97	52	3	1
Yellowstone N. P., Wyoming	2	58	324		
Shoshone N. F., Wyoming	1	158	5		
Washaki N. F., Wyoming	4	298	354		
Teton N. F., Wyoming	4	562	191		
Medicine Bow N. F., Wyoming	3	354	302	1	
Bridger N. F., Wyoming	3	72	48		
Grand Teton N. P., Wyoming	4	371	375		
Targhee N. F., Wyoming	1	10	29		
Targhee N. F., Idaho	2	218	14		
Caribou N. F., Idaho	4	109	16		
Challis N. F., Idaho	1	30			-
Sawtooth N. F., Idaho	1	10			
Payette N. F., Idaho	3	68			
Weiser N. F., Idaho	1	60			
Roosevelt N. F., Colorado	1	50	50		
Pike N. F., Colorado	4	110	326		
Arapaho N. F., Colorado	1	40			
Routt N. F., Colorado	4	185			
Rocky Mt. N. P., Colorado	7	386	264		
Total	55	3,287	2,410	4	1

*Blister rust infection outside forest boundary

SPREAD OF BLISTER RUST IN THE WEST



LEGEND

(1910) PINE INFECTION AND YEAR OF ORIGIN	— BOUNDARY OF INFECTION ON RIBES
(1952) RIBES INFECTION AND YEAR FOUND	— BOUNDARY OF INFECTION ON PINE
	WHITE PINE
	STATE LINES

BLISTER RUST CONTROL, INLAND EMPIRE, 1952

By

Frank O. Walters, Assistant Project Leader

Practically all Bureau and Forest Service blister rust control operations are close to or ahead of schedule on the 5-year program. White pine units included in the program are being brought to maintenance as rapidly as possible. Some difficulty has been experienced on the St. Joe and Coeur d'Alene Areas where blow-downs occurring in pole stands have caused regeneration of ribes, necessitating rework in portions of units previously on maintenance. As ribes elimination on units progresses, the disposition of hand crews on these lands depends on the checking organization locating and delimiting scattered areas in need of work. The dispatch with which the eradication forces find and effectively remove ribes from such areas directly affects costs. These two phases of the work are closely integrated. Stress has been placed on increasing the efficiency of search so that scattered ribes populations can be cleaned up at a minimum cost.

Due to the dry summer and fall, spread of rust to pine should be very light in 1952. Uredinial development was heavy, but transition into the telial stage was lighter than normal with increasing dissipation of formed telia as the season advanced.

During the past winter, the Ribes Eradication Methods Committee reviewed all phases of the program affecting production or efficiency. Subcommittees were assigned to thoroughly study each activity with a view toward improving methods and correcting faults. These committees reported back to the Methods Committee, which digested the more detailed information. Definite recommendations were made where specific improvements were possible; in other cases, suggestions were given. In general, the study committees recommended refinements in methods and practices already in use and close adherence to tried and proven techniques, expansion of chemical work, better foremanship and training, and early and thorough recruitment in the most likely localities to secure sufficient numbers of high caliber workers. The committee reports were presented and discussed at a joint meeting of Bureau and Forest Service blister rust personnel. Accomplishments in the 1952 season indicate that the application of recommended practices and careful attention to details in approved methods resulted in significant improvement. For example, on Bureau operations the man-hours required to work an acre were 19 percent less than in the preceding season, while the same high efficiency standards were maintained.

In 1952, chemical methods were used on 2,368 acres, an increase of 516 acres over the preceding season; also, 389,387 gallons of solution were used, an increase of 169,650 gallons. Contributing to this expansion of chemical work was the increasing ability of crews to recognize and treat effectively smaller pieces of ground; also, more complete utilization of various types of chemical equipment was a factor. An important addition to the project's chemical equipment was a light portable power sprayer that is easily transported into remote areas. The Bean-Cutler sprayer has not been entirely satisfactory since its weight made transportation difficult in steep, rough terrain. The new sprayer, weighing only 46 pounds, and a 220-gallon self-supporting collapsible canvas tank were developed by the D&I project. This equipment proved its adaptability in

field trials during the past season, supplying three nozzles and operating efficiently under all conditions. The ease and speed with which it can be moved makes it a valuable addition to the project chemical equipment. In one case, it was used in conjunction with a booster pump to treat areas a considerable distance from an adequate water supply.

The wisdom of protecting understocked stands of white pine on good sites has been proven. Where such stands were protected from blister rust and fire, they continued to fill in with white pine. Competition from other species did not become a factor on better sites. Now these well-stocked white pine stands exist over extensive areas on formerly poorly-stocked lands in the Clarkia-Bovill-Elk River areas on the St. Joe and to a certain extent on the other forests. Twenty years ago protection of these lands was considered by many to be a poor economic venture. An important factor aiding in this protection was the fire history following logging, which left a low ribes potential on many of these same lands. Where ribes eradication was performed early in the life of the stands, before a duff mantle produced a favorable storage environment for ribes seed, the threat of future ribes regeneration from stand disturbances was largely eliminated.

The 4,310-acre plot to study effectiveness of control, partially established in 1951, was completed during the current season. Five disease-free trees were selected at each of the 249 stations placed at 5-chain intervals along the strips which grid the plot. These trees will be examined periodically over a period of years to determine precisely the effectiveness of our present control standards and size of protection zones. To supplement this study, a stocking-disease survey will be run in 1953 adjacent to the grid lines to study the development of the stand over a period of years under the protection conditions present on the plot. Over a period of time, these findings should show what replacements may be expected for white pine killed by the rust.

The North Idaho Forestry Association held its fall quarterly meeting at the headquarters of the Clearwater Timber Protective Association. One day was devoted to blister rust control activities. A field trip proved an excellent medium for pointing out problems and demonstrating effectiveness of the work. Locations were visited where initiation of control work had been delayed and resultant losses were evident. Other places were shown where control work had been on schedule and very little damage had occurred. Many areas visited showed that very satisfactory white pine values can be anticipated.



W1606
Area in 1937. Open stand of young white pine and other species, near Clarkia, Idaho.



W1606-10
Same area in 1947. Protected from blister rust and fire, the area now supports a densely stocked stand of young growth.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952
INLAND EMPIRE

Item	Bureau of Entomology & Plant Quarantine				Forest Service BLR-4	Total		
	Cooperative Control		Total	BLR-4				
	Federal	State & Private						
Salaries & Wages	\$56,644	\$ 75,555	\$44,994	\$120,549	\$177,193	\$ 727,617		
Contract ribes erad.		5,028	5,298	10,326	10,326	\$ 72,383		
Subsistence supplies	3,601	17,911	2,494	20,405	24,006	203,614		
Chemicals		10,323		10,323	10,323	5,065		
Equipment		2,222		2,222	2,222	42,742		
Travel and transp.	2,191	4,113	412	4,525	6,716	33,959		
Other expenses	1,554	3,879	39	3,918	5,472	33,236		
Total	\$63,990	\$119,031	\$53,237	\$172,268	\$236,258	\$1,118,616		
						\$1,354,874		



TABLE 2

RIBES ERADICATION BY AGENCIES
INLAND EMPIRE, 1952

Agency	State	Working	Acres	Man-Days	Ribes	Spray Gallons	Per Acre		
							Man-Days	Ribes	
Bureau Cooperative	Idaho	First	2,140	2,010	1,158,200	117,100	.94	541	
		Second	1,770	1,840	31,200		1.04	18	
		Other	4,600	4,240	56,700	11,990	.92	12	
		Total	8,510	8,090	1,246,100	129,090	.95	146	
Forest Service	Idaho	First	2,700	4,350	266,600	44,500	1.61	99	
		Second	14,320	12,960	344,400	104,930	.91	24	
		Other	13,810	14,630	152,300	6,930	1.06	11	
		Total	30,830	31,940	763,300	156,360	1.04	25	
	Montana	First	440	1,230	245,000	7,520	2.80	557	
		Second	1,760	1,720	117,000	22,300	.98	66	
		Other	2,380	2,180	67,300	130	.92	28	
		Total	4,580	5,130	429,300	29,950	1.12	94	
	Washington	First	3,610	3,060	341,000	60,860	.85	94	
		Second	1,010	1,360	65,000	7,240	1.35	64	
		Other	1,470	1,320	53,000	5,890	.90	36	
		Total	6,090	5,740	459,000	73,990	.94	75	
	Total	First	6,750	8,640	852,600	112,880	1.28	126	
		Second	17,090	16,040	526,400	134,470	.94	31	
		Other	17,660	18,130	272,600	12,950	1.03	15	
		Total	41,500	42,810	1,651,600	260,300	1.03	40	
TOTALS		First	8,890	10,650	2,010,800	229,980	1.20	226	
		Second	18,860	17,880	557,600	134,470	.95	30	
		Other	22,260	22,370	329,300	24,940	1.00	15	
		Total	50,010	50,900	2,897,700	389,390	1.02	58	

TABLE 2a

CONTRACT AND CHEMICAL WORK
INLAND EMPIRE, 1952

Agency	Working	Contract Work Completed					Chemical Work		
		Number of Contracts	Acres	Man-Days	Ribes	Amount Paid	Acres	Man-Days	Gallons
Bureau Cooperative	First						447	508	117,100
	Second								
	Other	10	783	568	14,445	\$10,327	61	69	11,992
	Total	10	783	568	14,445	\$10,327	508	577	129,092
Forest Service	First	4	251	263	13,826	\$ 5,007	546	900	112,880
	Second	16	629	430	10,357	10,370	640	1,338	134,470
	Other	35	1,998	1,790	44,170	38,429	674	726	12,945
	Total	55	2,878	2,483	68,353	\$53,806	1,860	2,964	260,295
Total	First	4	251	263	13,826	\$ 5,007	993	1,408	229,980
	Second	16	629	430	10,357	10,370	640	1,338	134,470
	Other	45	2,781	2,358	58,615	48,756	735	795	24,937
	Total	65	3,661	3,051	82,798	\$64,133	2,368	3,541	389,387



TABLE 3

RIBES ERADICATION BY TYPES
INLAND EMPIRE, 1952

Agency	Type	Working			
		First Acres	Second Acres	Other Acres	Total Acres
Bureau Cooperative	Cutover 1940-1949	2,040	480		2,520
	Cutover 1920-1939			1,850	1,850
	Reproduction 1910-1939		750	980	1,730
	Pole		540	1,200	1,740
	Mature	30			30
	Stream	70		570	640
	Total	2,140	1,770	4,600	8,510
Forest Service	Burn 1950-1954	90			90
	Burn 1940-1949	10	20		30
	Plantation 1950-1954	300			300
	Plantation 1940-1949		790	1,940	2,730
	Cutover 1950-1954	140			140
	Cutover 1940-1949	90	670	10	770
	Cutover 1920-1939	770	650	530	1,950
	Reproduction 1910-1939	2,170	3,880	9,440	15,490
	Pole	2,590	8,580	3,790	14,960
	Mature	330	1,960	40	2,330
	Stream	260	540	1,910	2,710
	Total	6,750	17,090	17,660	41,500
	Burn 1950-1954	90			90
	Burn 1940-1949	10	20		30
Total	Plantation 1950-1954	300			300
	Plantation 1940-1949		790	1,940	2,730
	Cutover 1950-1954	140			140
	Cutover 1940-1949	2,130	1,150	10	3,290
	Cutover 1920-1939	770	650	2,380	3,800
	Reproduction 1910-1939	2,170	4,630	10,420	17,220
	Pole	2,590	9,120	4,990	16,700
	Mature	360	1,960	40	2,360
	Stream	330	540	2,480	3,350
	Total	8,890	18,860	22,260	50,010

TABLE 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION
INLAND EMPIRE, 1952

State	Working	Number of Acres Worked												GRAND TOTAL
		By Forest Service				By Bureau of Entomology and Plant Quarantine				Total Federal	Total Other			
		National Forests	State	Private	Total	National Forests	State	Private	Total		National Forests	State	Private	Total
Idaho	First	2,110	80	510	2,700	10	380	1,750	2,140	2,120	460	2,260	2,720	4,840
	Second	13,460	310	550	14,320	110	950	710	1,770	13,570	1,260	1,260	2,520	16,090
	Other	10,760	1,130	1,920	13,810	750	2,040	1,810	4,600	11,510	3,170	3,730	6,900	18,410
	Total	26,330	1,520	2,980	30,830	870	3,370	4,270	8,510	27,200	4,890	7,250	12,140	39,340
Montana	First	440			440					440				440
	Second	1,760			1,760					1,760				1,760
	Other	2,380			2,380					2,380				2,380
	Total	4,580			4,580					4,580				4,580
Washington	First	3,230			3,610					3,230			380	3,610
	Second	940			1,010					940			70	1,010
	Other	1,470			1,470					1,470				1,470
	Total	5,640			6,090					5,640			450	6,090
Total	First	5,780	80	890	6,750	10	380	1,750	2,140	5,790	460	2,640	3,100	8,890
	Second	16,160	310	620	17,090	110	950	710	1,770	16,270	1,260	1,330	2,590	18,860
	Other	14,610	1,130	1,920	17,660	750	2,040	1,810	4,600	15,360	3,170	3,730	6,900	22,260
	Total	36,550	1,520	3,430	41,500	870	3,370	4,270	8,510	37,420	4,890	7,700	12,590	50,010



TABLE 5

SUMMARY OF RIBES ERADICATION BY PROGRAMS
INLAND EMPIRE, 1923-1952

State	Class	Workings				Man-Days	Ribes	Spray Gallons	Per Acre	
		First Acres	Second Acres	Other Acres	Total Acres				Man-Days	Ribes
Idaho	EQ-Coop.	225,000	83,000	59,000	367,000	223,000	32,983,000	554,000	.61	90
	EQ-Emerg.	399,000	104,000	12,000	515,000	404,000	96,874,000	214,000	.78	188
	FS-Reg.	252,000	227,000	135,000	614,000	633,000	89,605,000	796,000	1.03	146
	FS-Emerg.	305,000	32,000	1,000	338,000	216,000	56,636,000	125,000	.64	168
	CCC	528,000	55,000	7,000	590,000	661,000	123,729,000	656,000	1.12	210
	Total	1,709,000	501,000	214,000	2,424,000	2,137,000	399,827,000	2,345,000	.88	165
Montana	EQ-Coop.	1,000	1,000		2,000	3,000	762,000	35,000	1.50	381
	EQ-Emerg.	64,000	1,000	1,000	66,000	31,000	5,775,000	1,000	.47	88
	FS-Reg.	39,000	19,000	9,000	67,000	81,000	7,211,000	153,000	1.21	108
	FS-Emerg.	34,000	2,000		36,000	36,000	7,358,000	22,000	1.00	205
	CCC	13,000	1,000		14,000	13,000	1,472,000		.93	105
	Total	151,000	24,000	10,000	185,000	164,000	22,588,000	211,000	.89	122
Washington	EQ-Emerg.	48,000	13,000	4,000	65,000	63,000	17,826,000		.97	274
	FS-Reg.	29,000	30,000	18,000	77,000	63,000	12,193,000	134,000	.82	158
	FS-Emerg.	35,000	2,000		37,000	14,000	4,014,000		.38	108
	CCC	20,000	2,000		22,000	25,000	3,487,000		1.14	159
	Total	132,000	47,000	22,000	201,000	165,000	37,520,000	134,000	.82	187
	EQ-Coop.	226,000	84,000	59,000	369,000	226,000	33,745,000	589,000	.61	91
Totals	EQ-Emerg.	511,000	118,000	17,000	646,000	498,000	120,475,000	215,000	.77	186
	FS-Reg.	320,000	276,000	162,000	758,000	777,000	109,009,000	1,083,000	1.03	144
	FS-Emerg.	374,000	36,000	1,000	411,000	266,000	68,018,000	147,000	.65	165
	CCC	561,000	58,000	7,000	626,000	699,000	128,688,000	656,000	1.12	206
	Total	1,992,000	572,000	246,000	2,810,000	2,466,000	459,935,000	2,690,000	.88	164

TABLE 6

STATUS OF BLISTER RUST CONTROL ON
PRESENT CONTROL AREA IN STATE AND PRIVATE UNITS
INLAND EMPIRE, 1952

	Ownership	Total Acres	Acres Worked			Maintenance Deferred Mature Acres
			First	Second	Other	
Present Program Units	Federal	35,820	34,820	19,450	4,540	14,590
	St. & Pri.	152,410	123,820	63,260	23,570	58,240
	Total	188,230	158,640	82,710	28,110	72,830
High Value Units Outside Present Program	Reproduction and Pole	Federal	14,460	11,230	2,580	100
		St. & Pri.	81,290	29,170	5,650	140
		Total	95,750	40,400	8,230	240
	Mature	Federal	14,240	3,020	150	11,380
		St. & Pri.	174,780	60,130	4,210	770
		Total	189,020	63,150	4,360	770
	Federal		64,520	49,070	22,180	4,640
Totals	St. & Pri.	408,480	213,120	73,120	24,480	203,300
		Total	473,000	262,190	95,300	29,120
						234,310

Note: Compilation of data on the status of blister rust control on the present control area in national forest units had not been completed in time for inclusion in this report.

BLISTER RUST CONTROL, CLEARWATER AREA, 1952

By

M. C. Riley, Area Leader

D. J. Moore, Forester, U. S. Forest Service

D. F. Williams, Assistant Area Leader

J. P. Bushfield, Control Aid

The Bureau of Entomology and Plant Quarantine and the U. S. Forest Service each operated three camps during the 1952 season. Peak of employment for the six camps was 214 workers with approximately 15 percent having had previous blister rust control experience. The quality of labor is improving yearly, but capable cooks and supervisory personnel are still difficult to obtain. Full advantage was taken of the 48-hour week. Time lost because of fires was negligible.

The contract phase of ribes eradication was greatly accelerated in the Bureau program in 1952. Activities were started by negotiating bids on small areas until contractors became established, then areas were advertised for competitive bidding. Eight contracts totaling 603 acres were awarded at a net cost of \$6,724.63. Contract workers numbered 11 with one group of 5 being successful on 4 bids. Bid prices ranged from \$10.50 to \$13.69 per acre with the average net price paid to contractors being \$11.53 per acre. Specifications on all contracts met maintenance requirements. Contracting may upset camp organization when key men are the successful bidders but this is more than offset by the better quality of work at a lower cost. Contracting ribes eradication will be pushed to the fullest extent on state and private lands in the future. Forest Service plans for 1953 include several contract areas on the Beaver Creek plantation.

Chemical methods were employed whenever possible using aqueous solutions of 2,4,5-T and summer oil. Solution was applied from portable and truck-mounted power sprayers, knapsack spray units, and Hi-Fog guns. The decapitation method with 2,4,5-T solution or Ammate powder was used whenever practicable.

All hand ribes eradication work was checked by the lot method. Considerable early season post checking was done to delimit areas for 1952 work and formulate plans for the 1953 season. All post checking was done by the checker-flanker method. More experienced checkers than usual were available which lightened the training load. Refresher training was given experienced men and a regular training session was held for inexperienced checkers.

Cooperative Camps on Clearwater Timber Protective Association Lands. The integration of blister rust control and timber management on state and private lands is already in operation and has an active place in the plans of the agencies involved. A sustained yield of white pine is possible only if the re-establishment of white pine growing stock is successful on recently cutover areas. Co-operators are now logging areas with this objective in mind. Relogging of white pine areas is starting. The effect on the blister rust control program is being given full consideration by the land managing agencies concerned.

Seed source cuttings on valuable white pine producing units are developing well-stocked stands of young white pine which will be included in the blister rust protection program as soon as present work areas can be placed on a maintenance

basis. Lack of finances will be the only obstacle to working enough of these units in the future to maintain a sustained harvest of white pine on areas now being logged.

Progress of the work on units in the present program is on schedule and a great part of the area will be placed on maintenance as conditions favorable to ribes caused by logging activities are stabilized.

The Bureau cooperative program on state and private lands was conducted by one 35-man camp and two 30-man camps. The 35-man camp operated out of Blister Rust Control Headquarters and worked portions of Brown's Creek Unit 3 and Hildebrand Unit 6 near Pierce, Idaho. Work in Unit 3 was entirely first working in the Weaver and Brown's Creek drainages. Ribes were generally scarce over both areas and, barring future disturbance, rework should be light. Maintenance standards were attained on both blocks but logging is too recent to rely entirely on the current check.

White pine in Weaver Creek was cut in 1940-43. Upland area, where adequate white pine stocking has developed, and the major stream type were worked in 1952. The major stream type and two small upland areas where many small bushes were found were treated with the power sprayer. Protection costs on Weaver Creek are estimated at \$2.20 per M board feet. The initial work on Brown's Creek was on 1946-48 cutting. Although stream type and roadsides required working, approximately 60 percent of the area was ribes free. Power spray treatment was applied to 17 miles of road and a few small plots that contained many small ribes. The good seed source remaining will insure a full white pine stocking. Total protection costs should not exceed \$0.30 per M board feet.

A small area of second working in Mutton Gulch that could not be completed in 1951 was the only work performed in Hildebrand Unit 6. All second work in Mutton Gulch is now completed and maintenance standards achieved except for portions disturbed by 1951 relogging. Results of this disturbance cannot yet be appraised. Ribes have been generally light over the area and a very fine stand of young pine will be protected for an estimated \$0.70 per M board feet.

Ribes eradication contracts in Unit 6 covered a 40-acre pole stand in Rhodes Creek, 140 acres of old cutover in Flat Creek and 61 acres in Fromelt Creek drainages. These areas were parts of blocks not completed in 1950 and 1951. Contracting saved excessive travel time and road repairing that would have been required for crew transport.

The Jaype Camp worked class 1 area at the head of Quartz Creek in Jaype Unit 11. Post check had indicated that this area of light ribes concentration required another working. Eradication results were exceptional. Chemical work was limited to the decapitation of a few difficult bushes and treatment of scattered stream type ribes with knapsack spray units. Two ribes eradication contracts adjacent to those worked in 1950 completed the work necessary in the class 1 area west of the road on McCauley Creek. Work accomplished is a part of the final stage of protection in Unit 11 which should result in protecting an outstanding white pine stand at an estimated cost of \$1 per M board feet.



W526, W528
Brown's Creek Unit 3, CTPA, near Fierce, Idaho. Logged in 1947. Good seed source insures full white pine stocking. Areas shown were free of ribes except along streams and roads.

Work in Calhoun Unit 17 and Deer Creek Unit 18 was performed by the Reeds Creek camp located near Clearwater Timber Protective Association headquarters. A small area near Headquarters, Idaho, was worked by hand methods to complete work started in 1951 in Unit 17. Two areas totaling 61 acres south of the Big Island road in sections 21 and 22 were sprayed, using the truck-mounted power sprayers. The many small Ribes lacustre found on these areas in 1951 indicated that the ground should be treated chemically.

Major accomplishments of the Reeds Creek camp were the final working of the class 1 area on the west side of Deer Creek in Unit 18 and a portion on the east side of the drainage. Ground covered was placed on maintenance except for the head of Deer Creek where the removal of numerous ribes indicated that a future check will be advisable. Decapitation methods were used where necessary and scattered R. petiolare along Deer Creek were sprayed with the knapsack units. Contracts in Unit 18 were awarded on two 80-acre blocks which would have required too much travel time for regular crews to work economically.

Some of the oldest cutover lands in the Association were covered in working units 17 and 18 and estimated protection costs for blister rust, until relogging occurs, will be approximately \$1.50 per M board feet.

Clearwater National Forest Lands. Blister rust control on national forest lands has become an integral part of timber management. The 1952 blister rust control program was consistent with proposals set up in Division of Timber Management plans for the Pierce and Kelly Creek Working Circles to attain white pine management objectives. Two major objectives for the Pierce Working Circle are to maintain a steady flow of white pine products to local operators and to establish and protect sufficient white pine growing stock to sustain a continuous yield. Calculations in the management plan show that in 35 years white pine harvest from this working circle will be wholly dependent on timber now growing in present pole stands. To establish and maintain protection of these stands from blister rust, therefore, may be considered the primary objective.

Since there is an extreme shortage of white pine in the 0-40 year age class it is equally important that protection be given to recent plantations and to logged areas where white pine is becoming re-established naturally if the sustained yield objective is to be attained. Proper timing of work in and adjacent to these areas is essential.

In the Kelly Creek Working Circle, nearly all of the working units where site and topography make white pine management feasible are contained in the so-called "Cedars Block." Units 45 and 46 contain the only white pine reproduction and pole stands in the entire Kelly Creek Working Circle that are not irrevocably lost to blister rust. It is paramount that control work in these units be completed at the earliest date possible.

A review of the 1952 accomplishments outlined below will show that efforts are being directed toward these objectives.

Forest Service camps were located at Musselshell where work was performed in Units 54 and 55, on Orofino Creek in Unit 56, and on French Creek in Unit 58 in the Pierce Working Circle. As soon as roads were passable the Musselshell Camp

was moved to Moose Creek where work was performed in Units 45 and 46 in the Kelly Creek Working Circle.

In Unit 54 on Musselshell Creek second and third working was done on the edges of the control area in 1940-44 cutting, in pole stands, and in the recent white pine plantings. In addition to hand eradication, 75 acres of stream type on Musselshell Creek were treated with chemical by truck-mounted power sprayer. As a result of the work in this unit plantations have been worked to maintenance standards and there will be very little loss to blister rust. Cutover areas will probably need one more working before conditions stabilize. As proper timing permits the needed rework in this unit, the total blister rust control cost will be approximately \$0.50 per M board feet.

Work in Unit 55 on Swede Creek was completed as scheduled. That part cut over in 1945-49 has been too recently disturbed to be placed on maintenance but the pole and mature stands in the protection zone will not need further working. In the cutover area there was one portion of 9 acres where the power sprayer was used to treat the many ribes seedlings. Rework will be necessary in this unit because of salvage logging disturbances. It is estimated that total blister rust protection costs will not exceed \$1.40 per M board feet.

In Unit 56 on Orofino Creek, second and third working was done in the pole stands and on ground logged in 1945-49. The work was adjacent to 1951 work and continues the proper timing following logging. Considerable roadside spraying was done in the area and also in that portion south of Orofino Creek where the upland will be given initial working in 1953. Some stream type on Orofino Creek and heavy ribes concentrations in the adjoining upland were treated with chemical applied from truck-mounted and portable power sprayers. Pole stands were worked to maintenance but the recently cutover areas will need another working in some cases. Total blister rust control cost is estimated to be \$0.70 per M board feet.

The work in Unit 58 in French Creek was in the excellent pole and young mature stands which constitute one of the top priority units in the forest. Difficulty in getting the camp established because of the condition of the new road and the early loss of the crew reduced anticipated accomplishments. R. petiolare was sprayed in the tributaries of French Creek. When the entire unit has been given final working the blister rust protection cost will be approximately \$1.10 per M board feet.

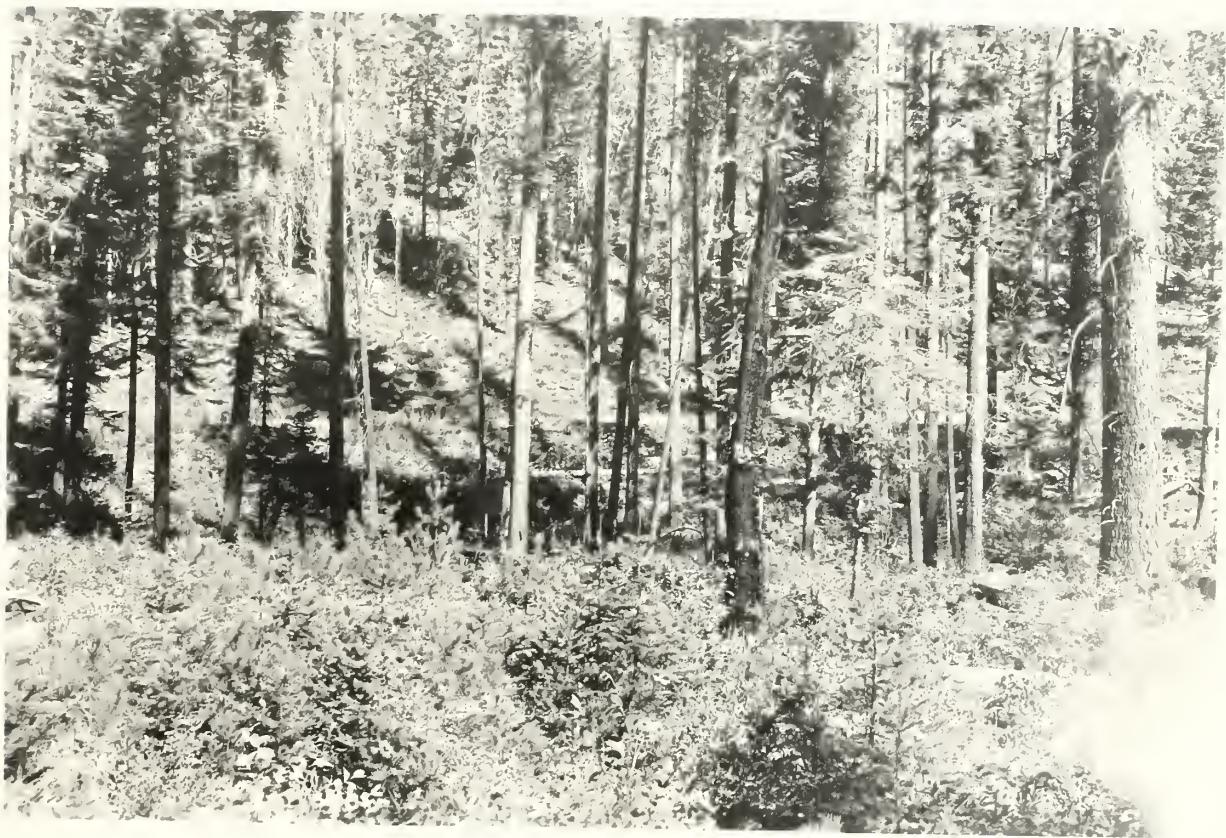
Rework started in Units 45 and 46 in the Kelly Creek Working Circle in 1951 was extended to the limits of the control area on Deadwood Creek. In addition, small patches of rework were completed on Independence Creek. A large portion of the natural reproduction and pole in these units is now on maintenance. Post check in about 3 years may indicate that scattered spots of rework will be necessary. These units stand very high in priority with an estimated blister rust control cost of \$0.90 per M board feet.

On the Clearwater National Forest, the major objectives of the 1952 program were met with the exception of the work planned in French Creek. Work schedules under the program are being maintained which will lessen rust losses. A large portion of the ground covered this year was recently logged, hence less area was placed on maintenance than in recent years. Recent cuttings in mature stands are reducing the total maintenance figure on national forest lands.



Moose Creek, Unit 45, Clearwater N.F. Natural NF reproduction. Area on maintenance.

W548



Swede Creek, Unit 55, Clearwater N.F. Area logged in 1947, leaving good seed source. Two workings reduced ribes to maintenance standards.

W517

On lands in the Clearwater Timber Protective Association most of the older cutover areas in the present control area have been placed on maintenance. Work is being extended into the Brown's Creek drainage where exceptionally favorable conditions exist for low cost protection of valuable new stands. Many excellent white pine reproducing areas cannot be protected under the present financial allotment and logging in high priority mature stands is adding to this category.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date:

TABLE I

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952
CLEARWATER AREA

Item	Bureau of Entomology & Plant Quarantine				Forest Service BLR-4	Total		
	Cooperative Control			Total				
	Federal BLR-1-4	State & BLR-3-4	Private					
Salaries & Wages	\$12,159	\$31,583	\$17,074	\$48,657	\$60,816	\$ 86,817 \$147,633		
Contract ribes erad.		5,028	1,697	6,725	6,725	6,725		
Subsistence supplies	254	7,029	1,166	8,195	8,449	19,484 27,933		
Chemicals		2,669		2,669	2,669	98 2,767		
Equipment		924		924	924	2,997 3,921		
Travel & transp.	496	1,106	125	1,231	1,727	5,169 6,896		
Other expenses	232	1,109	39	1,148	1,380	4,931 6,311		
Total	\$13,141	\$49,448	\$20,101	\$69,549	\$82,690	\$119,496 \$202,186		

TABLE 2

RIBES ERADICATION BY AGENCIES
CLEARWATER AREA, 1952

Agency	State	Working	Acres	Man-Days	Ribes	Spray Gallons	Per Acre		
							Man-Days	Ribes	
Bureau Cooperative	Idaho	First	1,100	750	82,900	15,850	.68	75	
		Second	460	440	4,800		.96	10	
		Other	1,840	1,790	31,400	11,990	.97	17	
		Total	3,400	2,980	119,100	27,840	.88	35	
Forest Service	Idaho	First	180	240	39,800	17,700	1.33	221	
		Second	2,610	1,820	101,900	6,640	.70	39	
		Other	1,540	1,400	38,600	280	.91	25	
		Total	4,330	3,460	180,300	24,620	.80	42	
TOTALS		First	1,280	990	122,700	33,550	.77	96	
		Second	3,070	2,260	106,700	6,640	.74	35	
		Other	3,380	3,190	70,000	12,270	.94	21	
		Total	7,730	6,440	299,400	52,460	.83	39	

TABLE 2a

CONTRACT AND CHEMICAL WORK
CLEARWATER AREA, 1952

Agency	Working	Contract Work Completed					Chemical Work		
		Number Contracts	Acres	Man-Days	Ribes	Amount Paid	Acres	Man-Days	Gallons
Bureau Cooperative	First						121	126	15,850
	Other	8	583	378	9,445	\$6,725	61	69	11,992
	Total	8	583	378	9,445	\$6,725	182	195	27,842
Forest Service	First						26	127	17,700
	Second						83	73	6,640
	Other						7	14	275
	Total						116	214	24,615
Totals	First						147	253	33,550
	Second						83	73	6,640
	Other	8	583	378	9,445	\$6,725	68	83	12,267
	Total	8	583	378	9,445	\$6,725	298	409	52,457

TABLE 3

RIBES ERADICATION BY TYPES
CLEARWATER AREA, 1952

Agency	Type	Working			
		First Acres	Second Acres	Other Acres	Total Acres
Bureau Cooperative	Cutover 1940-49	1,000	460		1,460
	Cutover 1920-39			1,800	1,800
	Pole			40	40
	Mature	30			30
	Stream	70			70
Forest Service	Total	1,100	460	1,840	3,400
	Plantation 1950-54	40			40
	Plantation 1940-49			80	80
	Cutover 1950-54	140			140
	Cutover 1940-49		460	10	470
	Pole		2,010	1,450	3,460
	Mature		60		60
	Stream		80		80
Totals	Total	180	2,610	1,540	4,330
	Plantation 1950-59	40			40
	Plantation 1940-49			80	80
	Cutover 1950-59	140			140
	Cutover 1940-49	1,000	920	10	1,930
	Cutover 1920-39			1,800	1,800
	Pole		2,010	1,490	3,500
	Mature	30	60		90
	Stream	70	80		150
	Total	1,280	3,070	3,380	7,730

TABLE 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION
CLEARWATER AREA, 1952

State	Working	Number of Acres Worked										GRAND TOTAL	
		By Forest Service		By Bureau of Entomology and Plant Quarantine			Total Federal		Total Other				
		National Forest	Total	State	Private	Total	National Forest	State	Private	Total			
		First	180	180	380	720	1,100	180	380	720	1,100	1,280	
Idaho	Second	2,610	2,610	90	370	460	2,610	90	370	460	3,070		
	Other	1,540	1,540	220	1,620	1,840	1,540	220	1,620	1,840	3,380		
	Total	4,330	4,330	690	2,710	3,400	4,330	690	2,710	3,400	7,730		

TABLE 5

SUMMARY OF RIBES ERADICATION BY PROGRAMS
CLEARWATER AREA, 1929-1952

State	Class	Workings				Man-Days	Ribes	Spray Gallons	Per Acre	
		First Acres	Second Acres	Other Acres	Total Acres				Man-Days	Ribes
Idaho	EQ-Coop.	37,000	20,000	18,000	75,000	72,000	9,294,000	301,000	.96	124
	EQ-Emerg.	82,000	47,000	5,000	134,000	125,000	30,398,000	137,000	.93	227
	FS-Reg.	87,000	41,000	30,000	158,000	136,000	30,925,000	220,000	.86	196
	FS-Emerg.	44,000	11,000	1,000	56,000	45,000	14,895,000	24,000	.80	266
	CCG	175,000	11,000	1,000	187,000	166,000	32,242,000	408,000	.89	172
	Total	425,000	130,000	55,000	610,000	544,000	117,754,000	1,090,000	.89	193

TABLE 6

STATUS OF BLISTER RUST CONTROL ON
PRESENT CONTROL AREA IN STATE AND PRIVATE UNITS
CLEARWATER AREA, 1952

Present Program Units	Ownership	Total Acres	Acres Worked			Maintenance Deferred Mature Acres
			First	Second	Other	
High Value Units	Federal	2,820	2,820	1,450	540	590
	St. & Pri.	51,410	43,820	20,260	8,570	14,240
	Total	54,230	46,640	21,710	9,110	14,830
Outside Present Program	Federal	1,460	1,230	580		40
	St. & Pri.	26,290	9,170	2,650	40	4,790
	Total	27,750	10,400	3,230	40	4,830
Mature	Federal	3,240	2,020	150		1,380
	St. & Pri.	78,730	38,130	4,210	770	50,270
	Total	82,020	40,150	4,360	770	51,650
Totals	Federal	7,520	6,070	2,180	540	2,010
	St. & Pri.	156,480	91,120	27,120	9,380	69,300
	Total	164,000	97,190	29,300	9,920	71,310

Note: Compilation of data on the status of blister rust control on the present control area in national forest units had not been completed in time for inclusion in this report.

BLISTER RUST CONTROL, ST. JOE AREA, 1952

By

H. J. Hartman, Area Leader

H. O. Ficke, Forester, U. S. Forest Service

W. F. Painter, Assistant Area Leader

C. J. Miller, Forestry Aid, U. S. Forest Service

Blister rust control was continued on the St. Joe National Forest and Potlatch Timber Protective Association for the 24th consecutive year. The Forest Service financed and administered nine 45-man camps and a ribes eradication contract program. The Bureau of Entomology and Plant Quarantine operated two 50-man camps on state and private lands in the Elk River and East Fork of Potlatch Creek drainages. At the peak of employment, there were 435 Forest Service and 100 Bureau employees. The Bureau supplied coordination and technical direction to the entire control program.

Since 1950 all control work has progressed according to schedule on the units composing the present 5-year program. If appropriations are maintained at present level, all presently required work on these units will be completed within the 5-year period ending in 1954. Control work on the Forest Service units would have been completed ahead of schedule but for the heavy snow damage that occurred in the pole stands of the Palouse River drainage in the winter of 1948-49 and subsequent years. This snow damage caused serious ribes regeneration and growth in stands that had been placed on maintenance. Current information is being maintained on which to base the selection of units to be added to the control program as work is completed on the units in the 5-year program.

The selection of additional units for the Forest Service program calls for careful analysis of the heavy blister rust damage in the deferred immature stands and the site quality and ownership pattern of mature stands. It appears that the units to be added to the Forest Service program will be largely "new crop" units resulting from the rehabilitation of cutover or burned lands of high site quality and of nearly solid federal ownership. The Bureau has a large number of high value units, largely state and private ownership, from which to select future control area.

Substantial progress is being made in coordinating blister rust control with timber management planning and practices on federal, state, and large private holdings. It includes: (1) the selection of the areas where white pine will be grown and protected; (2) the application of cutting methods or silvicultural treatments which will reduce the ribes eradication problem and secure the natural restocking of the areas to white pine or prepare the ground for planting. On Forest Service lands, special consideration is being given to small patches of mature timber in close association with immature white pine stands occurring within the control area. These small blocks of timber are being withheld from sale, since the cost of placing such areas back on maintenance following logging would far exceed the revenue from such sales.

Forest Service crews worked 14,400 acres and completed the presently required work on 11 of the 21 units in their present program. Bureau crews worked 2,880 acres and completed the presently required work on one unit. The work plan of

most camps called for the completion of the rework required to place entire units on maintenance. The crews of 9 of the 11 camps were chiefly employed on third and fourth working. These areas supported from 2 to 10 widely scattered ribes per acre. On such areas the use of chemical is limited to the decapitation method of ribes eradication. The one-man dragline method for hand eradication of ribes was employed in all camps. Workers were divided into crews of six to eight men with a straw boss in charge.

Chemical was used to treat 613 acres of heavy ribes concentrations on recently cutover areas and stream type. Three power sprayers together with knapsack sprayers were used to apply 2,4,5-T. Recently logged areas were broadcast sprayed by truck-mounted power sprayers at the rate of 310 gallons of chemical solution and 1.17 man-days per acre. A chemical concentration of 2,4,5-T of 2,000 p.p.m. was used throughout the season. The chemical solution costs 5¢ per gallon. Inspection of the 1951 chemical work indicated that a satisfactory eradication job had resulted. However, a light chemical rework job will be required in 2 years to complete the ribes eradication work. Some ribes regeneration is taking place in the soil disturbed by the bulldozer in converting cat-trails to truck-trails.

All ribes eradication by contract was financed by the Forest Service. The work was confined to the reproduction and plantation areas of Willow and Charlie Creek drainages near Emida, Idaho. All contract areas were difficult to work. At the peak of the season, 13 men were contracting. Most of the 613 acres worked were placed on maintenance. The average cost per acre for the completed areas was \$28.97. Three contracts awarded in late season will be completed by June 30, 1953. Ribes eradication by contract will be increased as rapidly as contractors become available.

Checking activities were managed by the Bureau with a Forest Service checker foreman assisting. There were 18 men in the checking organization. One or two checkers were assigned to each camp. Checking was kept current in order to facilitate rework and increase production and efficiency of eradication workers. Regular and post check work consumed all available time of the checkers. Approximately 16,000 acres were inspected by regular check and 12,000 by post check.

The year 1952 did not appear to be favorable for either local intensification or long distance spread of blister rust. Rust on ribes was light. One of the driest falls in the history of weather records was experienced.



W637

Elk River Unit. Natural WWP reproduction in openings of young WWP stand. Seed source is the 30-year-old trees. Area logged and broadcast burned between 1912 and 1916.



W604

The Diamond Match Company WWP log deck at Elk River, Idaho, rail siding. Logs were trucked to this point from Gold Creek. Large volumes of WWP are being harvested in the St. Joe area.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952
ST. JOE AREA

Item	Bureau of Entomology & Plant Quarantine					Forest Service BLR-4	Total		
	Cooperative Control			Total					
	Federal	State &	Private						
Salaries & Wages	\$17,061	\$29,899	\$17,650	\$47,549	\$64,610	\$235,696	\$300,306		
Contract ribes erad.						36,892	36,892		
Subsistence supplies	1,755	6,957	1,245	8,202	9,957	95,540	105,497		
Chemicals		7,039		7,039	7,039	300	7,339		
Equipment		788		788	788	14,974	15,762		
Travel & transp.	327	2,189	287	2,476	2,803	9,390	12,193		
Other expenses	1,283	1,491		1,491	2,774	200	2,974		
Total	\$20,426	\$48,363	\$19,182	\$67,545	\$87,971	\$392,992	\$480,963		

TABLE 2
RIBES ERADICATION BY AGENCIES
ST. JOE AREA, 1952

Agency	State	Working	Acree	Man-Days	Ribes	Spray Gallons	Per Acre		
							Man- Days	Ribes	
Bureau Cooperative	Idaho	First	1,040	1,260	1,075,300	101,250	1.21	1,034	
		Second	770	860	15,400		1.12	20	
		Other	1,070	1,310	11,300		1.22	11	
		Total	2,880	3,430	1,102,000	101,250	1.19	383	
Forest Service	Idaho	First	1,030	2,210	152,600	8,400	2.15	148	
		Second	3,240	3,790	67,400	430	1.17	21	
		Other	10,130	10,930	71,100	900	1.08	7	
		Total	14,400	16,930	291,100	9,730	1.18	20	
TOTALS		First	2,070	3,470	1,227,900	109,650	1.68	593	
		Second	4,010	4,650	82,800	430	1.16	21	
		Other	11,200	12,240	82,400	900	1.09	7	
		Total	17,280	20,360	1,393,100	110,980	1.18	81	

TABLE 2a

CONTRACT AND CHEMICAL WORK
ST. JOE AREA, 1952

Agency	Working	Contract Work Completed					Chemical Work		
		Number of Contracts	Acres	Man-Days	Ribes	Amount Paid	Acres	Man-Days	Gallons
Bureau Cooperative	First						326	382	101,250
	Total						326	382	101,250
Forest Service	First						60	133	8,400
	Second	1	16	21	709	\$ 432	50	105	430
	Other	12	597	676	8,681	17,330	177	212	900
	Total	13	613	697	9,390	17,762	287	450	9,730
Total	First						386	515	109,650
	Second	1	16	21	709	432	50	105	430
	Other	12	597	676	8,681	17,330	177	212	900
	Total	13	613	697	9,390	\$17,762	613	832	110,980

TABLE 3

RIBES ERADICATION BY TYPES
ST. JOE AREA, 1952

Agency	Type	Working			
		First Acres	Second Acres	Other Acres	Total Acree
Bureau Cooperative	Cutover 1940-49	1,040	20		1,060
	Reproduction 1910-39		750	830	1,580
	Pole			110	110
	Stream			130	130
Forest Service	Total	1,040	770	1,070	2,880
	Plantation 1950-54	260			260
	Plantation 1940-49		170	190	360
	Cutover 1920-39	100	240	440	780
	Reproduction 1910-39	500	1,450	6,640	8,590
	Pole	1,280	1,880		3,160
	Stream	170	100	980	1,250
Total	Total	1,030	3,240	10,130	14,400
	Plantation 1950-54	260			260
	Plantation 1940-49		170	190	360
	Cutover 1940-49	1,040	20		1,060
	Cutover 1920-39	100	240	440	780
	Reproduction 1910-39	500	2,200	7,470	10,170
	Pole		1,280	1,990	3,270
	Stream	170	100	1,110	1,380
	Total	2,070	4,010	11,200	17,280

TABLE 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION
ST. JOE AREA, 1952

State	Working	Number of Acres Worked													GRAND TOTAL	
		By Forest Service				By Bureau of Entomology and Plant Quarantine				Total Federal	Total Other					
		National Forest	State	Private	Total	National Forest	State	Private	Total	National Forest	State	Private	Total	State		
Idaho	First	740	80	210	1,030	10		1,030	1,040	750	80	1,240	1,320	2,070		
	Second	2,800	100	340	3,240	110	320	340	770	2,910	420	680	1,100	4,010		
	Other	7,390	1,050	1,690	10,130	750	150	170	1,070	8,140	1,200	1,860	3,060	11,200		
	Total	10,930	1,230	2,240	14,400	870	470	1,540	2,880	11,800	1,700	3,780	5,480	17,280		

TABLE 5

SUMMARY OF RIBES ERADICATION BY PROGRAMS
ST. JOE AREA, 1929-1952

State	Class	Workings				Man-Days	Ribes	Spray Gallons	Per Acre	
		First Acres	Second Acres	Other Acres	Total Acres				Man-Days	Ribes
Idaho	EQ-Coop.	22,000	30,000	24,000	76,000	65,000	7,529,000	247,000	.86	99
	EQ-Emerg.	190,000	42,000	3,000	235,000	158,000	45,593,000	77,000	.67	186
	FS-Reg.	90,000	98,000	73,000	261,000	290,000	36,777,000	354,000	1.11	141
	FS-Emerg.	71,000			71,000	45,000	15,333,000	101,000	.63	216
	CCC	172,000	18,000	2,000	192,000	225,000	56,890,000	248,000	1.17	296
	Total	545,000	188,000	102,000	835,000	783,000	160,122,000	1,027,000	.94	192

TABLE 6

STATUS OF BLISTER RUST CONTROL ON
PRESENT CONTROL AREA IN STATE AND PRIVATE UNITS
ST. JOE AREA, 1952

	Ownership	Total Acres	Acres Worked			Maintenance Deferred Mature Acres
			First	Second	Other	
Present Program Units	Federal	21,000	21,000	12,000	3,000	8,000
	St. & Pri.	55,000	41,000	24,000	7,000	23,000
	Total	76,000	62,000	36,000	10,000	31,000
High Value Units Outside Present Program	Federal	13,000	10,000	2,000	100	5,000
	St. & Pri.	55,000	20,000	3,000	100	9,000
	Total	68,000	30,000	5,000	200	14,000
	Federal	11,000	1,000			10,000
	St. & Pri.	96,000	22,000			81,000
	Total	107,000	23,000			91,000
Totals	Federal	45,000	32,000	14,000	3,100	23,000
	St. & Pri.	206,000	83,000	27,000	7,100	113,000
	Total	251,000	115,000	41,000	10,200	136,000

Note: Compilation of data on the status of blister rust control on the present control area in national forest units had not been completed in time for inclusion in this report.

BLISTER RUST CONTROL, COEUR D'ALENE AREA, 1952

By

F. J. Heinrich, Area Leader, Bureau of Entomology and Plant Quarantine

C. J. Pederson, Forest Officer, U. S. Forest Service

Blister rust control operations on the Coeur d'Alene National Forest for the third year of the 1950-54 control work plan were completed. Five camps with a peak employment of 160 men were operated during the field season. Contract work was performed by six operators with 18 men employed and 1,295 acres worked. Chemical ribes eradication methods were used more extensively than in any previous year. Scheduled surveys were completed with the stocking and pine damage survey data showing no appreciable changes in the status of the areas. Data on helicopter sprayed areas showed that considerable brush live-stem can be killed by this method, but little damage is done to mature ribes. Heavy snow damage occurring in pole stands and windthrow in mature stands during the past 3 years has increased protection costs.

The primary objective of the 1952 work plan was to complete currently-needed work in young stands and to extend protection zones in Deception, Hudlow, West Elk, and Alden Creek units. High cost initial work was encountered in these extensions,

Personnel hired for blister rust control work was well selected with 20 percent of the men being experienced workers. Men were thoroughly trained in basic ribes eradication methods with the mechanical phases of the work well understood before the technical aspects were taught. Green painted wooden sticks were used as an aid in teaching search techniques. Training results were satisfactory with continuous on-the-job training carried out during the work season. Manpower turn-over was small until crews quit to return to school or individuals left upon reaching the \$600 dependency limitations.

Contract work on 1,295 acres was successfully completed exceeding contract accomplishments of the preceding year. Twenty-seven contracts totalling 1,247 acres were located in the Alden Creek unit and one contract of 48 acres was located in the Clay Creek unit. Contracts were awarded at prices ranging from \$11 to \$28 with the average bid price being \$17.52 for all contracts. Contract procedure made a saving of approximately 20 percent over work by regular force account crews. Time extensions were not required on any of the contracts as all areas were completed during the current season.

Chemical ribes eradication methods were used on 420 acres supporting concentrations of ribes in Deception, Halsey, Hudlow, and West Elk units. Part of this acreage represented areas marked and by-passed by hand crews as being more economically handled by chemical methods. The two truck-mounted power sprayers were manned by four-man crews and three-man crews were used on two portable power spray units. Ten Hi-Fog guns and twenty knapsack sprayers were also used. A 200-gallon self supporting canvas tank especially built for holding spray solutions was used successfully with each portable power sprayer. Satisfactory results were obtained when 2,4,5-T solutions were properly applied. Previous spray results show that it will be necessary to re-treat mature ribes areas to mop-up seedling and resprout growth. A readily soluble marker to be mixed with chemical solutions is needed as an aid in obtaining proper application.

The decapitation method of ribes eradication was greatly increased in use over previous years. Each crewman and checker carried a 3-ounce oilcan containing a solution of 2,4,5-T, stove oil, and red marking dye. Small pruning shears were carried by some of the crewmen in place of the standard ribes picks. Instead of grubbing ribes, the stems were cut close to the ground and treated with the solution. Advantages over the grubbing method were apparent on some selected areas.

Stocking and pine damage surveys were performed by the checking personnel after the close of ribes eradication work. Surveys were confined to present program units and high value units that are being reanalyzed for possible inclusion into the present program. Survey strips totaled 2,200 chains, giving representative information on 6,600 acres. Data showed no appreciable change in status of any area although considerable pine infection occurred in 1948. Results of an inspection in 1952 showed no ribes regeneration in openings caused by pole blight damage.

Checking and survey work was satisfactorily performed by a 10-man checking crew. Two experienced checkers were available and an additional eight men were selected from among the eradication crewmen for checker training. One checker was permanently assigned to each camp where he worked in close cooperation with the camp superintendent. Camp checkers assisted the camp superintendent in establishing work area boundaries, trained men in laying lane lines, and promptly checked all lots as they were completed by the crewmen. Men were assigned from the post check crew to assist the camp checkers whenever the checking load in a camp became too heavy. Checkers not assigned to camps checked contract areas and worked with the post check crew. A meandering check using the standard 8-foot strip was used on areas worked by the lot method. Flanker check methods were used on the few areas not worked by the lot method and also on half the area post checked.

POST CHECK 1952

<u>Working Unit Number</u>	<u>Name</u>	<u>Drainage</u>	<u>Acres Checked</u>
2	Hudlow Creek	Nicholas Creek	600
10	Deception Creek	Sands Creek	120
10	Deception Creek	Coffee Creek	160
10	Deception Creek	Deception Creek	580
23	Halsey Creek	Halsey Creek	160
23	Halsey Creek	Drexal Creek	320
23	Halsey Creek	Little Elk Creek	520
25	Brett Creek	Molly Creek	1,010
25	Brett Creek	Brett Creek	640
25	Brett Creek	President and Vice President Creek	800
27	Lower Independence Creek	Lower Independence Creek	40
28	Snowbird Creek	Snowbird Creek	160
31	Alden Creek	Sheep Run Creek	140
			5,250

WORKING UNITS IN THE PRESENT BLISTER RUST CONTROL PROGRAM
COEUR D'ALENE AREA

Working Unit No.	Name	Acres	Man-Day Estimate for Protection Stands		1952 Work		Man-Days Previously Expended	Total Man-Days Expended	Man-Days Remaining 1950-54	M.B.F. Yield 1st 6 Periods	Man-Day Expenditure Per M.
			1950-1954	1955-1970	Acres	Man-Days					
10	Deception Creek	3,525	1,700	400	1,120	1,210	2,128	3,358	-1,638	25,640	.036
27	Owl Creek	5,267	1,731	396	90	70	914	984	747	83,650	.039
31	Alden Creek	4,267	629	337	1,360	990	247	1,237	-608	36,372	.041
28	Snowbird Creek	1,789	955	352			698	698	257	35,386	.051
34	Lost Fork Jordan	7,233	1,929	552					1,929	77,585	.055
25	Brett Creek	5,573	1,173	564	450	40	566	606	567	98,982	.033
32	Cathedral	2,544	1,673	404					1,673	46,753	.055
52	E. Fr. Lost Cr.	7,097	6,174	679				150	6,024	62,763	.139
35	West Elk	8,371	1,949	390	380	830	1,060	1,890	59	21,189	.167
88	White Creek	4,089	1,546	572			382	382	1,164	18,692	.130
21	Tan Hoosier	1,162	2,032	156					2,032	18,315	.120
23	Halsey	7,211	4,079	862	930	1,880	280	2,160	1,919	44,270	.135
2	Hudlow	6,350	4,199	630	1,030	1,390	2,364	3,154	445	53,674	.087
18	Trail Creek	2,074	2,947	414					3,361	22,119	.152
22	Teepee Creek	6,425	2,845	690	10	10	2,997	3,007	-1162	63,434	.048
90	Dudley Creek	7,054	2,602	801					2,602	29,782	.122
43*	Clay Creek	1,000			50	30	40				
	Total	81,061	38,163	8,199	5,420	6,450	11,646	18,246	20,371	739,596	.077

*Work to be financed from XV funds



Severe snow damage in WTP stands. Ribes regeneration has taken place as a result of canopy openings and ground disturbance. Top, Nicholas Creek area. Bottom, Little Elk Creek area.

W558, W585



STOCKING AND PINE DAMAGE SURVEYS, 1952

<u>Working Unit Number</u>	<u>Drainage</u>	<u>Chains Survey Strip</u>
1	Lone Cabin Creek	320
1	Burnt Cabin Creek	390
2	East Fork Hudlow Creek	110
2	Nicholas Creek	140
5	Solitaire Creek	190
10	Sands Creek	80
25	Brett Creek	100
25	Senator Creek	70
25	President and Vice President Creek	110
27	Owl Creek	180
32	Ethel and Cathedral Creek	270
38	Flat Creek	160
43	Little East Fork Steamboat Creek	80
		2,200

A helicopter was used in an experimental aerial application of chemical spray to a 360-acre brush area near Pack Sack Ridge and a 40-acre stream type area in Lower Independence Creek in July 1950. All the stream type and 190 acres of the brush area was re-treated from the air in August 1951. One pound of acid equivalent 2,4,5-T per acre was applied in each treatment. Results from a 200-chain systematic survey in the fall of 1952 on the upland type showed 67 percent of the brush live stem killed on the twice sprayed area and 49 percent dead on the single sprayed portion. Brush species upon which data were taken were Ceanothus, willow, ninebark, alder, and maple. Damage to mature ribes bushes from aerial spray was not significant. The Lower Independence Creek stream type area where spray was applied from a height of 50 feet showed a more satisfactory damage to brush species and Ribes inerme. Killing of the brush has opened up the area sufficiently that remaining ribes can be removed at a reasonable cost. The helicopter was not available for the spraying planned in 1952.

Control status of white pine stands on the Coeur d'Alene National Forest is classified as approximately one-third on maintenance and the remainder as post check or rework. Prior to 1950 the control area consisted of 383,000 acres of which 99,000 acres are classified as maintenance. This comprises 15,000 acres of reproduction, 32,000 acres of pole, and 52,000 acres of mature type. Thirty-one percent of the 81,000 acres within the selected units of the 1950-54 program is classified as maintenance. No net increase is shown in protected area as a result of 1952 work. Due to ground disturbance and canopy openings in pole stands resulting from severe snow damage during the winters of 1949, 1950, and 1951, several areas had to be removed from protected classification as additional work is needed.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952
COEUR D'ALENE AREA

Item	Bureau of Entomology and Plant Quarantine BIR-1-4	Forest Service BIR-4	Total
Salaries & Wages	\$6,209	\$109,049	\$115,258
Contract ribes erad.		22,730	22,730
Subsistence supplies		25,039	25,039
Equipment		5,752	5,752
Travel and transp.	191	3,306	3,497
Other expenses	11	18,476	18,487
Total	\$6,411	\$184,352	\$190,763

TABLE 2
RIBES ERADICATION BY AGENCIES
COEUR D'ALENE AREA, 1952

Agency	State	Working	Acres	Man-Days	Ribes	Spray Gallons	Per Acre		
							Man-Days	Ribes	
Forest Service	Idaho	First	770	1,210	52,200	10,750	1.57	68	
		Second	3,160	3,510	100,100	83,840	1.11	32	
		Other	1,490	1,730	30,600	5,660	1.16	21	
		Total	5,420	6,450	182,900	100,250	1.19	34	

TABLE 2a
CONTRACT AND CHEMICAL WORK
COEUR D'ALENE AREA, 1952

Agency	Working	Contract Work Completed					Chemical Work		
		Number of Contracts	Acres	Man-Days	Ribes	Amount Paid	Acres	Man-Days	Gallons
Forest Service	First	4	251	263	13,826	\$ 5,007	30	60	10,750
	Second	13	493	269	7,648	8,040	290	720	83,840
	Other	11	551	444	13,489	9,634	100	200	5,660
	Total	28	1,295	976	34,963	\$22,681	420	980	100,250

TABLE 3
RIBES ERADICATION BY TYPES
COEUR D'ALENE AREA, 1952

TABLE 4
OWNERSHIP OF LAND COVERED ON RIBES ERADICATION
COEUR D'ALENE AREA, 1952

Agency	Type	Working			
		First Acres	Second Acres	Other Acres	Total Acres
Forest Service	Plantation 1940-49		450	300	750
	Cutover 1940-49		50		50
	Cutover 1920-39	30	20		50
	Reproduction 1910-39	420	870	1,050	2,340
	Pole	120	1,140	60	1,320
	Mature	220	590		810
	Stream	10	30	60	100
	Total	770	3,160	1,490	5,420

State	Working	Acres Worked by Forest Service			
		National Forest	State	Private	Total
Idaho	First	770			770
	Second	3,020	140		3,160
	Other	1,380	80	30	1,490
	Total	5,170	220	30	5,420

TABLE 5
SUMMARY OF RIBES ERADICATION BY PROGRAMS
COEUR D'ALENE AREA, 1927-1952

State	Class	Workings				Man-Days	Ribes	Spray Gallons	Per Acre	
		First Acres	Second Acres	Other Acres	Total Acres				Man-Days	Ribes
Idaho	EQ-Coop.	26,000			26,000	8,000	2,846,000		.31	109
	EQ-Emerg.	41,000			41,000	36,000	6,589,000		.88	161
	FS-Reg.	54,000	41,000	22,000	117,000	139,000	16,042,000	153,000	1.19	137
	FS-Emerg.	102,000	10,000		112,000	87,000	17,620,000		.78	157
	CCC	126,000	18,000	4,000	148,000	220,000	26,145,000		1.49	177
	Total	349,000	69,000	26,000	444,000	490,000	69,242,000	153,000	1.10	156



BLISTER RUST CONTROL, KANIKSU AREA, 1952

By

H. A. Brischle, Area Leader

H. J. Viche, Forester, U. S. Forest Service

Q. W. Larson, Control Aid

The blister rust control program on the Kaniksu area consisted of 7 Forest Service camps employing 275 men and 2 Bureau of Entomology and Plant Quarantine camps employing 35 men. In addition to these camps, contract workers completed 16 areas totaling 1,174 acres. The first camp was opened on June 2 and all camps were closed early in September. The labor supply was adequate and compared closely to 1951 with respect to caliber of men and amount of turnover. Most of the crews were college students and came from all sections of the United States. About 20 percent of the men had previous blister rust experience. Because of an expanded program, there was a shortage of qualified supervisory personnel and checkers. The season was well along before all of these positions could be filled from the ranks.

Crews worked a 48-hour week. The season was dry and little time was lost on account of rain or fire. An active safety and accident prevention program kept lost-time accidents to a minimum. The Forest Service crews had one lost-time accident. The Bureau crews lost no time due to injuries for the third consecutive year.

The integration of chemical methods with hand work reached a new high. Early in the season, 2 days of instruction with field practice were given to acquaint supervisory personnel with the latest methods and advantages of using chemical. Members of the Spokane staff assisted in conducting the school. All types of chemical equipment were used effectively on large areas and in many instances on areas of less than an acre. In order to facilitate the use of power spray units, 3½ miles of project road were located from Sema Pass into the headwaters of Kalispell Creek. It is planned to construct this road in 1953.

Chemical ribes eradication work is summarized as follows:

Type of Equipment	Acres Treated	Man-Days	Gals. of Solution	Ribes Treated	Per Acre		
					M.D.	Gallons	Ribes
Truck-mounted power	400	520	83,050	230,600	1.30	208	577
Hand portable power	70	130	10,960	45,000	1.86	157	643
Back-pack	290	200	1,590	28,900	.69	5	100
Hi-Fog	20	20	150	4,000	1.00	8	200
Total	780	870	95,750	308,500	1.12	123	396

The Forest Service blister rust staffman and the district rangers are coordinating blister rust work with all phases of white pine management. The rangers have been supplied with maps and data and are kept up to date on the progress of blister rust control work on their districts. The removal of pole blight infected white pine, beetle infested Douglas fir and spruce stands, will add to the blister rust work load on several of our white pine units. The ribes regeneration caused by salvaging this timber will be felt several years hence. At the same time, blister rust work will be facilitated by the access roads constructed to take out the timber.

The 1952 season was the third year in the 1950-56 blister rust program. The table on the following page shows the progress to date and the amount of work remaining to be done through 1956.

The contract program for 1952 was on a comparable level with that of 1951, although more individuals were interested in contract work in 1952. Fourteen Forest Service and two Bureau contract areas were completed. Contract work is summarized as follows:

<u>Year</u>	<u>Agency</u>	<u>Contracts Completed</u>	<u>Acres</u>	<u>Net Paid Contractors</u>	<u>Net Per Acre</u>
1947-51	F.S.	61	5,314	\$66,955.35	\$12.60
1947-51	E.Q.	11	1,222	14,896.94	12.19
1952	F.S.	14	974	13,362.68	13.72
1952	E.Q.	2	200	3,601.50	18.01
Total 1947-52		88	7,710	\$98,816.47	\$12.82

The season was started with a less than normal checking force. In order to fill positions it was necessary to select qualified workers from the ranks and train them as the season progressed. At the peak of the season the checking organization in Forest Service and Bureau camps consisted of 22 men under the supervision of Q. W. Larson. All crew work was checked promptly to insure acceptable standards of performance. A total of 41,000 acres was post checked to locate 1953 camp areas. A total of 8,000 acres was found sufficiently low in ribes to be eliminated from further work. The checkers also assumed responsibility for string laying in the camp areas. A system of standardized numbering and lettering of lots and lanes was adopted. Permanent markers were placed to facilitate relocation of lanes for future work.

Forest Service Camps on Federal Lands

During the season, the Forest Service crews and contractors worked 12,770 acres. As a result of this work, 4,830 acres were placed on maintenance.

Location of Camps and Type of Work

<u>Unit Number</u>	<u>Name</u>	<u>Type of Work</u>
12	Pelke	Regular crews
22	Kalispell Creek	do.
27	Reeder Mountain	do.
41	Navigation	do.
42A	Hughes Ridge	do.
45	Big Muddy	do.
46	Tiger Hill	do.
1	Cuban Hill	Contractors
52	Pee Wee Creek	do.
3	Tunnel Creek	do.
19	Upper Lamb Creek	do.

FOREST SERVICE UNITS IN THE PRESENT 1950-56 PROGRAM

Unit	Name	Acres	Percent of Area Now on Maintenance	Total Man-Days Req. 1950-56 Program	Man-Days Used 1950-52	Man-Days Remaining for 1953-56	120-Year WP Yield Due BRC M.B.F.	Total Cost of BRC Per M First Crop White Pine
53	Experiment Station	6,260	65	3,030	60	2,970	39,940	2.56
22	Kalispell Creek	9,390	75	3,640	4,245	-605	228,300	1.34
46	Tiger Hill	5,380	75	1,870	1,060	810	68,250	1.58
27	Reeder Mountain	9,500	85	4,320	4,215	105	196,460	1.03
41	Navigation	4,140	60	2,270	1,225	1,045	74,770	1.26
28	Fedor Creek	2,400	95	270		270	30,560	3.10
19	Upper Lamb Creek	3,140	25	1,110	480	630	35,640	1.14
20	Kalispell Bay	6,940	70	1,860	80	1,780	124,870	.74
16	Binarch Creek	8,350	60	3,500		3,500	104,500	1.29
39	Boulder Creek	3,940	75	2,540	2,120	420	65,030	1.44
11A	Dubius Creek	1,370	30	940		940	18,440	1.91
60	Pack River	9,850	60	3,160		3,160	90,330	
1	Cuban Hill	1,510	85	470	190	280	10,960	2.33
4	Bear Paw	5,810	30	4,180		4,180	86,670	2.23
45	Big Muddy	7,710	25	4,380	3,070	1,310	62,340	2.82
12	Pelke	9,640	75	5,170	4,125	1,045	128,020	1.53
14	Solo Creek	11,190	45	1,580	15	1,565	86,200	.83
40	Lower Beaver	2,590	75	870		870	34,810	
23	Diamond Peak	870	50	1,060	1,300	-240	16,110	2.27
17	Lower Lamb Creek	11,530	50	6,030	70	5,960	135,270	1.21
42A	Hughes Ridge	9,050	60	5,660	2,000	3,660	94,370	1.35
3	Tunnel Creek	13,260	70	7,260	1,740	5,520	142,020	2.05
58	N. F. Grouse	6,050	50	3,300		3,300	39,440	3.62
52	PeeWee Creek	5,530	35	2,300	55	2,245	32,410	3.02
	Total	155,400		70,770	26,050	44,720	1,945,710	

BUREAU UNITS-REQUIREMENTS 1950-70 PROGRAM

Unit	Name	Acres	Percent of Area Now on Maintenance	Total Man-Days Req. 1950-70 Program	Man-Days Used 1950-52	Man-Days Remaining for 1953-70	120-Year WP Yield Due BRC M.B.F.	Total Cost of BRC Per M First Crop White Pine
80	Ruby Creek	5,560	80	800		800	81,000	1.00
81	Trapper Creek	9,220	90	3,110	1,490	1,620	177,590	1.13
82	Caribou Creek	4,980	40	1,280	260	1,020	54,210	1.33
84	Bear Creek	3,420	90	1,240		1,240	9,910	2.50
90	Middle Fk.E.River	6,310		5,500		5,500	127,000	.87
91	Fox Creek	3,360	90	310	310		31,560	2.59
92	Big Creek	8,000	45	3,140	160	2,980	42,270	4.32
93	Samuels	4,520	60	2,580		2,580	29,390	4.94
94	Hellroaring	5,150	80	1,600		1,600	55,870	2.23
59	Trail Creek	7,440	65	4,260	2,550	1,710	74,170	2.08
	Total	57,960		23,820	4,770	19,050	682,970	



Trapper Creek Unit, PLTPA. Photographed in 1932, year of first ribes eradication. W1076



Same area in 1952, showing rapid growth of WWP and increasing density of stand. Area on maintenance. W1076-1

Work was done on the Pelke unit with a crew that averaged 25 men. Truck-mounted power sprayers as well as back-pack units were used to spray young ribes in recent cutover areas. Intensive white pine management is being practiced on the unit. For several years cutting practices have been followed which minimize ribes regeneration. Cutover areas are being rehabilitated. In 1951 all merchantable products were removed from a 90-acre block by a small local mill, after which the few unmerchantable trees were felled and the area was broadcast burned early in September during favorable weather conditions. The area was cleanly burned and will be planted to white pine in the near future.

A 20-man crew continued work in the Kalispell Creek unit. In addition to the regular crew work, portable power spray units were used on heavy ribes concentrations around the upper boundary. The spray equipment was back-packed in by the crew. Due to the scarcity of water, one pumper was used to lift the water several hundred feet in elevation where the chemical was mixed and pumped out by a second pumper.

Work was continued in the Reeder Mountain unit from a 25-man pack camp located in Athol Creek. This crew completed required work on 1,480 acres. Back-pack chemical units were employed to good advantage on concentrations of Ribes lacustre and R. viscosissimum. About 95 percent of the work on this unit has been completed, and 85 percent of the worked area has been put on maintenance.

A 50-man camp at Hughes Meadows continued work in the Hughes Ridge unit and did necessary work on an area of 1,700 acres largely in reproduction and pole stands. Post check showed 60 percent of this unit on maintenance. Work is planned in this unit in 1953.

A camp was located for the first time since 1943 in the Navigation unit which contains over 4,000 acres of 50-year-old white pine pole, almost entirely federal ownership. This area of high site quality is capable of producing 69 million board feet of white pine at an estimated cost of \$1.26 per M for blister rust control. Work will be continued in this unit in 1953.

Two camps were established in the vicinity of Ione, Washington, in the Big Muddy and Tiger Hill units. Work in the Tiger Hill unit is now far enough along so that the remaining work can be finished by contractors in 1953. Heavier ribes concentrations than anticipated were encountered in the Big Muddy unit in an area where poles were harvested. Chemical was used on a large part of the area. Work is planned here again in 1953 with chemical equipment and hand crews.

Bureau Camps on State and Private Lands

Two Bureau camps were located in the Trapper Creek drainage. Upland work is now completed and only a small amount of future work in stream type will be necessary. First ribes eradication was done in 1932. Parts of the area were again worked in 1946. This high value unit on the Priest Lake Timber Protective Association contains over 9,000 acres, of which 8,500 belong to the State of Idaho. Approximately 75 percent of the area is well stocked with white pine 40-60 years old, capable of producing 177 million board feet of pine at maturity. The total cost of blister rust control is estimated to be \$1.13 per M. The accompanying pictures show the excellent growth this stand has made since 1932.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952
KANIKSU AREA

Item	Bureau of Entomology & Plant Quarantine					Forest Service BLR-4	Total		
	Cooperative Control			Total					
	Federal	State &	Private						
BLR-1-4	BLR-3-4	Total	Total	Total	Total	BLR-4	Total		
Salaries & Wages	\$14,964	\$14,073	\$10,270	\$24,343	\$39,307	\$192,900	\$232,207		
Contract ribes erad.			3,601	3,601	3,601	12,761	16,362		
Subsistence supplies	1,592	3,925	83	4,008	5,600	42,939	48,539		
Chemicals		615		615	615	2,500	3,115		
Equipment		510		510	510	10,080	10,590		
Travel & transp.	653	818		818	1,471	7,610	9,081		
Other expenses	28	1,279		1,279	1,307	5,392	6,699		
Total	\$17,237	\$21,220	\$13,954	\$35,174	\$52,411	\$274,182	\$326,593		

TABLE 2

RIBES ERADICATION BY AGENCIES
KANIKSU AREA, 1952

Agency	State	Working	Acres	Man-Days	Ribes	Spray Gallons	Per Acre	
							Man-Days	Ribes
Bureau Cooperative	Idaho	Second	540	540	11,000		1.00	20
		Other	1,690	1,140	14,000		.67	8
		Total	2,230	1,680	25,000		.75	11
Forest Service	Idaho	First	720	690	22,000	7,650	.96	31
		Second	5,310	3,840	75,000	14,020	.72	14
		Other	650	570	12,000	90	.88	18
	Washington	Total	6,680	5,100	109,000	21,760	.76	16
		First	3,610	3,060	341,000	60,850	.85	94
TOTALS	Total	Second	1,010	1,360	65,000	7,240	1.35	64
		Other	1,470	1,320	53,000	5,890	.90	36
		Total	6,090	5,740	459,000	73,990	.94	75
	Total	First	4,330	3,750	363,000	68,510	.87	84
		Second	6,860	5,740	151,000	21,260	.84	22
	Other	3,810	3,030	79,000	5,980	.80	21	
	Total	Total	12,770	10,840	568,000	95,750	.85	144
		First	4,330	3,750	363,000	68,510	.87	84
		Second	6,860	5,740	151,000	21,260	.84	22
		Other	3,810	3,030	79,000	5,980	.80	21
		Total	15,000	12,520	593,000	95,750	.83	40

TABLE 2a

CONTRACT AND CHEMICAL WORK
KANIKSU AREA, 1952

Agency	Working	Contract Work Completed					Chemical Work		
		Number Contracts	Acres	Man-Days	Ribes	Amount Paid	Acres	Man-Days	Gallons
Bureau Cooperative	Other	2	200	190	5,000	\$ 3,602			
Forest Service	First						370	430	68,510
	Second	2	120	140	2,000	1,898	120	220	21,260
	Other	12	850	670	22,000	11,465	290	220	5,980
Totals	Total	14	970	810	24,000	13,363	780	870	95,750
	First						370	430	68,510
	Second	2	120	140	2,000	1,898	120	220	21,260
	Other	14	1,050	850	27,000	15,067	290	220	5,980
	Total	16	1,170	1,000	29,000	\$16,965	780	870	95,750

TABLE 3

RIBES ERADICATION BY TYPES
KANIKSU AREA, 1952

Agency	Type	Working			
		First Acres	Second Acres	Other Acres	Total Acres
Bureau Cooperative	Cutover 1920-39			50	50
	Reproduction 1910-39			150	150
	Pole		540	1,050	1,590
	Stream			140	140
	Total		540	1,690	2,230
Forest Service	Plantation 1940-49		170	1,140	1,310
	Cutover 1940-49	90	160		250
	Cutover 1920-39	670	380	70	1,120
	Reproduction 1910-39	1,030	740	400	2,170
	Pole	2,470	3,550	260	6,280
	Mature		1,190		1,190
	Stream		70	130	250
Totals	Total	4,330	6,320	2,120	12,770
	Plantation 1940-49		170	1,140	1,310
	Cutover 1940-49	90	160		250
	Cutover 1920-39	670	380	120	1,170
	Reproduction 1910-39	1,030	740	550	2,320
	Pole	2,470	4,090	1,310	7,870
	Mature		1,190		1,190
	Stream		70	130	690
	Total	4,330	6,860	3,810	15,000

TABLE 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION
KANIKSU AREA, 1952

State	Working	Number of Acres Worked												GRAND TOTAL	
		By Forest Service				By Bureau of Ent. and Pl. Quar.				Total Federal		Total Other			
		National Forest	State	Private	Total	State	Private	Total	National Forest	State	Private	Total	State	Private	Total
Idaho	First	420		300	720				420		300	300	720		
	Second	5,030	70	210	5,310	540		540	5,030	610	210	820	5,350		
	Other	450		200	650	1,670	20	1,690	450	1,670	220	1,890	2,340		
	Total	5,900	70	710	6,680	2,210	20	2,230	5,900	2,280	730	3,010	8,910		
Washington	First	3,230		380	3,610				3,230		380	380	3,610		
	Second	940		70	1,010				940		70	70	1,010		
	Other	1,470			1,470				1,470				1,470		
	Total	5,640		450	6,090				5,640		450	450	6,090		
Totals	First	3,650		680	4,330				3,650		680	680	4,330		
	Second	5,970	70	280	6,320	540		540	5,970	610	280	890	6,860		
	Other	1,920		200	2,120	1,670	20	1,690	1,920	1,670	220	1,890	3,810		
	Total	11,540	70	1,160	12,770	2,210	20	2,230	11,540	2,280	1,180	3,460	15,000		

TABLE 5

SUMMARY OF RIBES ERADICATION BY PROGRAMS
KANIKSU AREA, 1923-1952

State	Class	Workings				Man-Days	Ribes	Spray Gallons	Per Acre	
		First Acres	Second Acres	Other Acres	Total Acres				Man-Days	Ribes
Idaho	EQ-Coop.	140,000	33,000	17,000	190,000	78,000	13,314,000	6,000	.41	70
	EQ-Emerg.	81,000	14,000	4,000	99,000	69,000	11,334,000		.76	114
	FS-Reg.	21,000	47,000	10,000	78,000	68,000	5,561,000	69,000	.87	75
	FS-Emerg.	88,000	11,000		99,000	39,000	8,788,000		.39	89
	CCC	55,000	8,000		63,000	50,000	8,452,000		.79	134
Washington	Total	385,000	113,000	31,000	529,000	304,000	47,749,000	75,000	.57	90
	EQ-Emerg.	30,000	2,000		32,000	19,000	6,754,000		.59	211
	FS-Reg.	29,000	30,000	18,000	77,000	63,000	12,193,000	134,000	.82	158
	FS-Emerg.	35,000	2,000		37,000	14,000	4,014,000		.38	108
	CCC	20,000	3,000		22,000	25,000	3,487,000		1.14	159
Totals	Total	114,000	36,000	18,000	168,000	121,000	26,448,000	134,000	.72	157
	EQ-Coop.	140,000	33,000	17,000	190,000	78,000	13,314,000	6,000	.41	70
	EQ-Emerg.	111,000	16,000	4,000	131,000	88,000	18,088,000		.67	138
	FS-Reg.	50,000	77,000	28,000	155,000	131,000	18,054,000	203,000	.85	116
	FS-Emerg.	123,000	13,000		136,000	53,000	12,802,000		.39	94
	CCC	75,000	10,000		85,000	75,000	11,939,000		.88	140
	Total	499,000	149,000	49,000	697,000	425,000	74,197,000	209,000	.61	106

TABLE 6

STATUS OF BLISTER RUST CONTROL ON
PRESENT CONTROL AREA IN STATE AND PRIVATE UNITS
KANIKSU AREA, 1952

(All units are in present program)

Ownership	Total Acres	Acres Worked			Maintenance Deferred Mature Acres
		First	Second	Other	
Federal	12,000	11,000	6,000	1,000	6,000
St. & Pri.	46,000	39,000	19,000	8,000	21,000
Total	58,000	50,000	25,000	9,000	27,000

Note: Compilation of data on the status of blister rust control on the present control area in national forest units had not been completed in time for inclusion in this report.

BLISTER RUST CONTROL, CABINET NATIONAL FOREST, 1952

By

H. J. Faulkner, Area Leader

Neil Fullerton, Forester, U. S. Forest Service

White pine blister rust control was carried on in the Cabinet National Forest during the 1952 season in accordance with the long-range unit work plans. Ribes eradication was performed to protect white pine plantations and natural reproduction stands in the following working units: Middle and West Fork units of Big Creek in the St. Regis River drainage; South Fork of Martin and White Pine Creek units in the Clark Fork River drainage.

Workers were plentiful but of only fair quality. They were mostly high school and college freshmen working in the woods for the first time. Lack of experienced straw bosses delayed full scale production. Only 25 man-days were lost to fire fighting duty despite an unusually hot and dry season.

Chemical was used extensively for the eradication of stream type and upland ribes. Four types of chemical equipment were used for applying 2,4,5-T. Hi-Fog guns and knapsack units were used for stream type and small concentrations in the upland. Portable Bean-Cutler and truck-mounted power units were used for treating large concentrations in the upland. Chemical could be used to a greater degree in the future at reduced costs by using lighter portable power units and by necessary replacement and repair of present equipment.

Big Creek Units Nos. 21 and 22

A 90-man camp was established May 25 on the West Fork of Big Creek. The camp was originally planned for a 50-man crew, but was expanded to take care of 36 men later moved to White Pine Creek and Minton Ridge camps. The entire force was trained and worked at Big Creek until road repairs made possible the establishment of other camps.

The work plans called for a mop up of all stream type within the protected areas, reworking the upland areas within and adjacent to the 20- to 30-year-old white pine plantations on the Middle Fork and West Fork of Big Creek, and a 50-acre extension of the protection zone on the upper West Fork.

Ninety acres of stream type averaging 33 ribes and .7 man-day per acre were mopped up with knapsack units and Hi-Fog guns. The rework of the plantation areas proved to be more difficult than anticipated. It was necessary to use intensive methods on areas planned for fast flanker work.

The 50-acre protection zone extension was extremely difficult working. Heavy concentrations of Ribes lacustre were intermingled with heavy brush and windfall. Forty of the fifty acres were sprayed with a Bean-Cutler power unit at savings of about 7 man-days per acre over hand methods. A Bean De Luxe Spraymaster number 785 orchard type spray gun was tried experimentally on the heavy concentrations of old R. lacustre bushes. This gun with a capacity of from 1 to 50 gallons per minute has an advantage over the Pecan gun for this type of spraying because the larger volume and greater driving force give faster coverage and more adequate drench of root crowns. The effectiveness of kill in comparison

with the Pecan cannot be determined until next year. The new 220-gallon canvas mixing tank, easily carried by one crewman, facilitated the mixing of chemical. Previously, two 30-gallon metal cans were used requiring the full time of one man at the machine. Three mixings a day in the canvas tank were prepared by the foreman without interfering with his other duties. The difficult task of moving the portable sprayer over rugged terrain demonstrated the need for the lighter power sprayer now under development by the Bureau of Entomology and Plant Quarantine.

Infection and damage have increased in the Middle and West Fork plantations since last surveyed in 1949. In most areas the main source of infection is from scattered ribes within the area and adjacent stream type. The 100-acre plantation at the confluence of the Middle and West Forks is believed to be an exception as the area has been on maintenance since 1945 and checks in 1952 failed to show ribes within the stand. Disease survey in 1952 showed that infection increased from 57 to 77 percent and damage to stocking from 47 to 61 percent from 1947 to 1950. It appears that infection is coming from ribes over the ridge in Rivers Creek and along the main ridge to the south. Due to originally heavy stocking of pine, the area still remains in classes 1 and 2. The 195-acre plantation 2 miles up the Middle Fork has been severely damaged by the rust. Infection has increased from 65 to 84 percent and damage to stocking from 48 to 74 percent from 1947 to 1950. Checks made in 1952 show that the probable sources of infection are the scattered ribes within the stand and in the protection zone extending to the ridge top.

Protection work on other plantations on the West Fork must be completed in 1953 to prevent further damage and loss of the stands. A 40-man camp will be required during 1953 to complete work in the Big Creek units and to rework stream type and protection zones around the Savenac Nursery.

Savenac Nursery, Unit No. 20

An examination of 5,000 2-2 stock white pine transplants in the Savenac Nursery showed 420 infected. Infection in the 2-4 stock was higher due to the longer period of exposure. Of the 1,200 examined, 411 were infected. While no increase in infection in nursery stock has occurred for several years, there is danger of a serious increase during a favorable infection year if ribes are allowed to increase in the adjacent stream bottoms and upland protection zones. Stream type on Savenac and Big Creeks and upland spots near Haugan Lookout will be reworked during the 1953 season.

White Pine Creek, Unit No. 16

Work was initiated in 1949 for the protection of 700 acres of well stocked 20- to 30-year-old white pine plantations. Approximately 80 percent of initial work was completed that year with no additional work until 1952. The 1952 objective was to complete the initial work and rework the 1949 area. Accomplishments were less than anticipated due to a late start on July 5 and an early leaving of the crew.

The flanker method was used to good advantage on parts of area where brush cover was light to eliminate large scattered ribes. Ribes in 40 acres of stream type were chemically treated, using knapsack units. Seven hundred gallons of 2,4,5-T solution were used. In initial working, Hi-Fog guns were used to good advantage



W771

West fork of Big Creek. Bean-Cutler portable power sprayer with newly developed 220-gallon canvas tank. Water supplied by gravity flow from nearby stream.



W756

South fork of Martin Creek. Truck-mounted power sprayer. Water supplied by auxiliary 600-gallon truck-mounted tank.

to spray old, heavy concentrations of R. lacustre intermingled with dense brush.

Rust damage is light except in a narrow belt adjacent to the stream type. Delayed rust intensification in the drainage may be partially explained by complete absence of highly susceptible R. petiolare in the stream type and predominance of less susceptible R. lacustre in the upland.

A 15-man camp will be required in 1953 to complete the work.

Martin Creek, Unit No. 14

The only work planned during 1952 was a respray of 60 acres in the head of the South Fork of Martin Creek that was initially sprayed in 1950. The area originally supported a heavy concentration of brush and R. lacustre. The 1950 spray served to open up the area by partially killing the heavy brush cover and a high percentage of the ribes live steam. Numerous ribes seedlings and re-sprouts required a broadcast coverage of most of the area in 1952. A truck-mounted Friend power sprayer and Pecan guns with No. 5 discs were used to apply a 2,500 ppm aqueous solution of 2,4,5-T with a one-half percent oil emulsion spreader.

As infection is slowly increasing on submaintenance areas in the unit, ribes should be reduced to a maintenance standard as soon as possible for protection of plantations and natural reproduction stands. Power spraying of the heavy R. lacustre area at the head of the South Fork should be completed in 1953.

CONTROL STATUS

Control of white pine blister rust in the units in the St. Regis River drainage has been very difficult. The wide and brushy stream bottoms originally containing abundant R. petiolare and R. inerme have presented difficult conditions for accomplishing complete suppression of ribes. The upland areas with steep slopes, heavy brush cover, and ribes have also required costly ribes eradication measures. The heavy concentrations of R. petiolare and R. viscosissimum led to an early introduction and establishment of the rust which has reached a critical stage in both the plantations and natural stands. Since the white pine is located on the lower slopes with heavy ribes populations occurring above, the determination of adequate protection boundaries is difficult. While it is advisable to extend these boundaries in some cases, a careful analysis of the value of the pine in relation to the added control costs should be made to determine where the cost of additional extensions are warranted to secure safe protection limits and where it is best to take the risk of possible additional damage from long distance spread.

The working units located on the south side of the Clark Fork River including White Pine Creek, Trout Creek, Robin Run Creek, South Fork of Martin Creek, Pilgrim Creek, and Skelton Creek present a more favorable opportunity for controlling the rust. R. petiolare did not exist in these units and R. lacustre is the predominant upland species. The less susceptible ribes species and somewhat drier climate favored a later introduction and slower intensification of the rust than in the St. Regis River drainage. Working conditions on many areas are comparable to the St. Regis drainage and ribes populations must be

reduced to the same maintenance standards to prevent eventual loss of the stands. In most cases, control can be established under present plans before serious damage occurs.

The working units on the north side of the Clark Fork River including the Bull River units, Rock Creek, and McKay Creek are presently in a deferred status due to the threat of pole blight.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952 CABINET AREA

Item	Bureau of Entomology and Plant Quarantine BLR-1-4	Forest Service BLR-4	Total
Salaries & Wages	\$3,125	\$ 71,255	\$ 74,380
Subsistence supplies		12,895	12,895
Equipment		7,634	7,634
Travel and transp.	262	5,054	5,316
Chemical		2,167	2,167
Other expenses		2,043	2,043
Total	\$3,387	\$101,048	\$104,435

TABLE 2

RIBES ERADICATION BY AGENCIES
CABINET AREA, 1952

Agency	State	Working	Acres	Man-Days	Ribes	Per Acre		
						Spray Gallons	Man-Days	Ribes
Forest Service	Montana	First	230	890	210,000	7,090	3.67	913
		Second	860	870	67,000	22,300	1.01	78
		Other	1,440	1,720	49,000	130	1.19	34
		Total	2,530	3,480	326,000	29,520	1.38	129

TABLE 2a

CHEMICAL WORK
CABINET AREA, 1952

Agency	Working	Acres	Man-Days	Gallons
Forest Service	First	50	120	7,090
	Second	100	220	22,300
	Other	100	80	130
	Total	250	420	29,520

TABLE 3

RIBES ERADICATION BY TYPES
CABINET AREA, 1952

Agency	Type	Working			
		First Acres	Second Acres	Other Acres	Total Acres
Forest Service	Reproduction	220	820	1,350	2,390
	Stream	10	40	90	140
	Total	230	860	1,440	2,530

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION
CABINET AREA, 1952

State	Working	Acres Worked by
		Forest Service
Montana	First	230
	Second	860
	Other	1,440
	Total	2,530

TABLE 5

SUMMARY OF RIBES ERADICATION BY PROGRAMS
CABINET AREA, 1928-1952

State	Class	Workings				Man-Days	Ribes	Per Acre		
		First Acres	Second Acres	Other Acres	Total Acres			Spray Gallons	Man-Days	Ribes
Montana	EQ-Reg.	1,000	1,000		2,000	3,000	762,000	35,000	1.50	381
	EQ-Emerg.	32,000	1,000	1,000	34,000	16,000	3,840,000	1,000	.47	113
	FS-Reg.	18,000	11,000	7,000	36,000	53,000	4,790,000	125,000	1.47	133
	FS-Emerg.	30,000	1,000		31,000	31,000	6,991,000	22,000	1.00	226
	CCC	2,000	1,000		3,000	6,000	516,000		2.00	172
	Total	83,000	15,000	8,000	106,000	109,000	16,899,000	183,000	1.03	159

BLISTER RUST CONTROL, KOOTENAI NATIONAL FOREST, 1952

By

H. J. Faulkner, Area Leader
M. D. Oaks, Forester, U. S. Forest Service

Ribes eradication in the Kootenai National Forest was concentrated in the Spar Lake Unit for the protection of 1,700 acres of excellent 50- to 60-year-old white pine. In addition to the Spar Lake camp, a four-man crew worked out of the Troy Ranger Station during late May and early June on the lower Star Creek plantation and a seven-man crew worked from the Sylvanite Ranger Station from late June to mid-August on the Yaak River Units.

The camp superintendent and straw bosses were exceptionally well qualified. They were successful in securing good production and high efficiency from what appeared to be only a fair class of labor.

Spar Lake Unit No. 15. A 45-man camp was established June 7 at the mouth of Hyatt Creek. The 1952 work plan called for reworking all pole and mature stands where checks indicated that additional work was necessary to place the area on a maintenance basis; reworking all stream type within and adjacent to the protected areas and initially working the Spar Lake improvement area. During the season it was decided to initially work 110 acres of mature type in the head of Farway Creek for protection of the excellent pole stands in that drainage.

In pole type, 520 acres were worked for the second time and 140 acres for the third time, requiring .9 and .2 of a man-day per acre, respectively. Ribes averaged 30 per acre on second working and 2 on third working. The initial working of the mature type in Farway Creek was difficult due to the heavy concentrations of Ribes lacustre and brush. Eight acres of heavy ribes were chemically treated with knapsack sprayers. An average of 265 ribes per acre was removed at 2.3 man-days per acre.

Scattered blowdown in the pole and mature type in 1949 caused the germination of ribes seed which increased the cost of this year's work and prevented the placing of all areas on maintenance. Future checks and some rework will be necessary in portions of the stands where the blowdown occurred. The first known outbreak of pole blight in the unit was found in 1952 near the forks of Hyatt Creek.

Lower Star Creek Unit No. 8. On May 28 a four-man crew was started on the lower Star Creek plantation to eradicate scattered ribes before leafing out of other vegetation reduced visibility. A rapid coverage of the area was completed on June 22. An average of 2 ribes per acre was removed from 230 acres at .3 of a man-day per acre. Checks following the eradication showed less than one ribes per acre remaining. Future work will be limited to the lighter burned portions of the area where seedlings were found this year.

Yaak River Units Nos. 2, 4, and 6. On June 22 a seven-man crew was established at the Sylvanite Ranger Station to perform rework in the following units: Red Top, Cyclone, Burnt, and Spread Creeks. An average of 64 ribes per acre was removed from 160 acres of stream type in the 4 units. Rework of the stream type on Cyclone, Red Top, and Burnt Creek was confined to the lower portions of the drainages accessible from the Yaak River road. Small pack camps will be

required to complete work in the upper drainages. One hundred and three man-days were expended in the Spread Creek Unit on 28 acres of 1940 burn and 55 acres of pole type.

The excellent pole stands in the Yaak River Units are approaching maintenance. Future work will be confined to stream bottoms and border zones and to small upland areas around rock outcrops, blowdowns, and other recent disturbances. Two 15-man camps will be required to complete necessary work in 1953.

Cherry Creek Unit No. 18. This 4,500-acre unit is composed of 1,000 acres of mature timber and 3,500 acres of 50-year-old pole stands. Initial work was performed in 1950. Ribes were light in the upland but relatively heavy in the stream type. A 20-man camp will be established in 1953 to rework all stream type and portions of the upland necessary to place the unit on a maintenance basis.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952
KOOTENAI AREA

Item	Bureau of Entomology and Plant Quarantine BLR-1-4	Forest Service BLR-4	Total
Salaries and Wages	\$3,126	\$31,900	\$35,026
Subsistence supplies		7,717	7,717
Equipment		1,305	1,305
Travel and transp.	262	3,430	3,692
Other expenses		2,194	2,194
Total	\$3,388	\$46,546	\$49,934

TABLE 2

RIBES ERADICATION BY AGENCIES
KOOTENAI AREA, 1952

Agency	State	Working	Acres	Man-Days	Ribes	Spray Gallons	Per Acre		
							Man- Days	Ribes	
Forest Service	Montana	First	210	340	35,000	430	1.62	167	
		Second	900	850	50,000		.94	56	
		Other	940	460	18,300		.49	19	
		Total	2,050	1,650	103,300	430	.80	50	

TABLE 2a

CHEMICAL WORK
KOOTENAI AREA, 1952

Agency	Working	Chemical Work		
		Acres	Man-Days	Gallons
Forest Service	First	10	30	430

TABLE 3

RIBES ERADICATION BY TYPES
KOOTENAI AREA, 1952

Agency	Type	Working			
		First Acres	Second Acres	Other Acres	Total Acres
Forest Service	Burn 1950-54	90			90
	Burn 1940-49	10	20		30
	Plantation 1940-49			230	230
	Pole		600	140	740
	Mature	110	120	40	270
	Stream		160	530	690
	Total	210	900	940	2,050

TABLE 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION
KOOTENAI AREA, 1952

State	Working	Acres Worked by Forest Service	
		National Forest	
Montana	First		210
	Second		900
	Other		940
	Total		2,050

TABLE 5

SUMMARY OF RIBES ERADICATION BY PROGRAMS
KOOTENAI AREA, 1952

State	Class	Workings				Man- Days	Ribes	Spray Gallons	Per Acre		
		First Acres	Second Acres	Other Acres	Total Acres				Man- Days	Ribes	
Montana	EQ-Emerg.	32,000			32,000	15,000	1,935,000		.47	60	
	FS-Reg.	21,000	8,000	2,000	31,000	28,000	2,421,000	28,000	.90	78	
	FS-Emerg.	4,000	1,000		5,000	5,000	377,000		1.00	75	
	CCC	11,000			11,000	7,000	956,000		.64	87	
	Total	68,000	9,000	2,000	79,000	55,000	5,689,000	28,000	.70	72	

BLISTER RUST CONTROL, MOUNT RAINIER NATIONAL PARK, 1952

By

J. C. Gynn, Area Leader

C. M. Chapman, District Leader

The 1952 white pine blister rust control program in Mount Rainier National Park was completed as scheduled. The work consisted of eliminating ribes concentrations on cliffs and precipitous slopes between Sunrise Park and the White River campground. The removal of these ribes will alleviate damage to the whitebark pine (*Pinus albicaulis*) in the Sunrise Park area above and to the western white pine (*P. monticola*) in the White River campground area below. A plan formulated with Park Service officials permitted all crews to work in high priority areas throughout the summer and still be readily available for fire duty. The accomplishments of the new camp superintendent and checker were commendable. The crew was well organized and ribes eradication methods were used to best advantage.

Ribes eradication. Acres worked, 610; man-days, 670; ribes removed per acre, 62. A superintendent, a checker, and 16 laborers were employed. Ribes eradication started June 17 and terminated September 3. The crews were trained with the aid of illustrated charts and practical application of methods in the field. The dragline system was used almost exclusively because the precipitous topography, windfalls, and dense brush made the use of chemical methods impractical.

Checking and control status. Areas worked were checked and control status classification made accordingly. A large portion of the 1952 work was classified in the rework category because of the large number of ribes removed and probable future germination of ribes seed. Table 4 shows control status classifications for both the White River and Silver Forest areas.

Blister rust infection. A disease survey was run on the Longmire-Silver Forest area in the vicinity of Ricksaker Point and Canyon Rim. Western white pine (*P. monticola*) reproduction less than 5 feet in height was examined with the following results: Number of trees examined, 228; number of trees infected, 32; number of trees with trunk cankers, 9. The youngest canker found was in 1948 wood, probably of 1950 origin. The last ribes eradication on the area was done in late 1950.

A disease survey was run on the White River control unit in the north portion of Sunrise Park. Whitebark pine (*P. albicaulis*) of reproduction size was examined with the following results: Number of trees examined, 295; number of trees infected, 154; number of trees with trunk cankers, 7. The youngest infection noted was in 1948 wood, probably of 1950 origin. The last ribes eradication influencing the area sampled was done in 1951 and 1952. Sixty man-days were spent on canker elimination in this area during inclement weather. Canker elimination as performed in 1952 in conjunction with maintenance work should reduce future losses.

RECOMMENDATIONS

Longmire-Silver Forest. Maintenance work previously scheduled for 1952 but delayed by more urgent control work necessary in the White River area should be done in 1953.

An inspection made in 1952 showed additional broadcast spraying of Ribes acerifolium seedlings must be done in the power line clearings. It was also noted considerable Hi-Fog gun work in conjunction with the one-man dragline system will be required to eliminate R. bracteosum seedlings occurring in the vicinity of Narada Falls.

The following recommendations are made to accomplish the work: A superintendent (GS-6), a checker (GS-5), and 15 crewmen for a 3-month period beginning approximately June 15.

The above estimate is sufficient to take care of time lost from rain, fire, crew reduction, and other unforeseen circumstances. The estimate is made on the basis of a 6-day work week.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date:

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952 MOUNT RAINIER NATIONAL PARK

Item	National Park Service
Personal Services	\$12,233.37
Travel & Transp.	56.00
Communication Service	5.37
Rentals (equipment)	470.50
Contractual Services	192.43
Supplies & Materials	181.58
Salary, Checker	980.50
Total	\$14,119.75

TABLE 2

**SUMMARY OF RIBES ERADICATION
MOUNT RAINIER NATIONAL PARK, 1952**

Area	Working	Acres	Man-Days	Ribes Species		Total Ribes	Per Acre	
				Ribes lacustre	Ribes viscosissimum		Man-Days	Ribes
White River	Other	610	670	35,000	3,000	38,000	1.10	62

Not included above: 60 man-days - canker elimination

TABLE 3

**SUMMARY OF RIBES ERADICATION
MOUNT RAINIER NATIONAL PARK, 1930-1952
(Net Control Area)**

Area	Working				Man-Days	Total Ribes	Spray Gallons	Per Acre	
	First Acres	Second Acres	Other Acres	Total Acres				Man-Days	Ribes
Longmire-Silver Forest	1,300	1,290	3,700	6,290	7,250	636,000	370	1.15	101
White River	3,200	3,010	8,130	14,340	10,510	996,000	3,450	.73	69
Total	4,500	4,300	11,830	20,630	17,760	1,632,000	3,820	.86	79

Chemical work included above:

Working	Acres	Man-Days	Spray Gallons
Second	60	60	180
Other	610	690	3,640
Total	670	750	3,820

TABLE 4

**STATUS OF BLISTER RUST CONTROL, 1952
MOUNT RAINIER NATIONAL PARK**

Area	Control Unit Total Acres	Maintenance Acres	Work Required		
			Initial Acres	Rework Acres	Post Check Acres
Longmire-Silver Forest	1,300	930		370	
White River	3,200	2,480		630	90
Total	4,500	3,410		1,000	90

BLISTER RUST CONTROL, GLACIER NATIONAL PARK, 1952

By

J. C. Gynn, Area Leader

C. M. Chapman, District Leader

Ribes eradication work for the control of white pine blister rust in Glacier National Park was performed on the Park Headquarters, Lake McDonald, and Oldman Lake control units. A good training program was prepared and given all workers on their arrival June 16 by park officials followed by additional training from Bureau of Entomology and Plant Quarantine representatives. The 1952 objectives were to perform scheduled maintenance work in the Park Headquarters and Lake McDonald units and to do urgently needed second working in the Oldman Lake control unit. All objectives were accomplished except at Oldman Lake. Because of men leaving early, the Oldman Lake camp was closed August 22 rather than September 5. Only 710 effective man-days were obtained from a possible 1,334 had the entire crew remained between the period June 30 to September 5. Inclement weather and mechanical failures of spraying equipment also hindered the work.

Park Headquarters. An early season post check showed maintenance work to be necessary in the stream type along the Flathead River and in the upland in the east protection zone. A crew of a foreman and four men was augmented by the Oldman Lake crew from June 16 to 29. The one-man dragline system was used exclusively as the ribes were small and scattered. All scheduled work was completed by August 7. Acres worked, 210; man-days, 240; ribes removed per acre, 14.

Lake McDonald. The Park Headquarters crew began maintenance work in the Snyder Creek drainage August 8. All scheduled maintenance work in the Lake McDonald unit was completed by August 29. Acres worked, 440; man-days, 50; ribes removed per acre, 2.

Oldman Lake. Acres worked, 320; man-days, 710; ribes removed per acre, 209. A portable Bean Cutler power spraying unit was used for the first time in this park. This unit, in conjunction with Hi-Fog guns and manually operated trombone pumps, was used for chemically treating heavy ribes concentrations remaining in the east protection zone. These ribes were a serious threat and have been causing damage to the whitebark pine (*Pinus albicaulis*) in the main control area. The one-man dragline system was employed to eliminate scattered ribes in other portions of the unit. A good pack camp was constructed on the former site. A new propane gas cooking range greatly reduced kitchen costs by eliminating the expensive operations of cutting and transporting wood for cooking fuel. The compressed gas was transported by pack mule with the weekly order of food supplies.

Checking and Control Status. Nearly all final checking in the Park Headquarters and Lake McDonald units was performed by a representative of the Bureau of Entomology and Plant Quarantine. Results showed only a minimum amount of future maintenance work will be required to sustain a high degree of protection for the two units. A final check of the work at Oldman Lake was not completed as the checker trainee was used on ribes eradication. Control status classification of the area will remain unchanged until necessary additional checking and ribes eradication work are completed. Control status classification for all Glacier National Park blister rust control units appear in table 4.

Blister Rust Infections. Systematic disease surveys were run on the Oldman Lake and Two Medicine areas with the following results:

<u>Area</u>	<u>Tree Species</u>	<u>Trees Examined</u>	<u>Trees Infected</u>	<u>Trees with Trunk Cankers</u>	<u>Tree Size</u>
Oldman Lake	<u>Pinus albicaulis</u>	677	45	11	Reproduction
Two Medicine	<u>Pinus flexilis</u>	131	42	6	Reproduction

The disease increase at Oldman Lake over the 1948 survey results is due to infection then present but not visible. The extremely severe climatic conditions and short growing season at this high altitude seem to retard the incubation period as no infection was found on wood younger than 1947. The infection increase in the Two Medicine area shows a pattern normally expected as the youngest infection found was in 1948 wood. Last ribes eradication in the Two Medicine area was done in 1950.

RECOMMENDATIONS

Park Headquarters. No additional ribes eradication work is anticipated until after a post check is performed in 1954 or 1955.

Lake McDonald. No additional ribes eradication work is anticipated until after a post check is performed in 1954 or 1955.

Two Medicine. Scheduled maintenance ribes eradication work should be performed in 1954.

East Glacier. Part of the scheduled maintenance work should be done June 15-30, 1953, while training the Oldman Lake crew prior to starting in the Oldman Lake area. The work should be completed in 1954.

Oldman Lake. The unfinished second working scheduled for 1952 should be completed in 1953.

The following estimate is made to accomplish the 1953 work: A crew composed of a camp superintendent, a checker, and 10 crewmen is recommended. The entire crew should report for training in the East Glacier area June 15 and transferred to the Oldman Lake area as soon as snow conditions and pack camp installations permit. Work should continue until September 15 if weather conditions are favorable.

Several additional men should be hired at the start to take care of man-day losses caused from late arrival, quits, and workers leaving early. The above estimate is based on a 6-day work week.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date:

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952 GLACIER NATIONAL PARK

Item	National Park Service
Personal Services	\$19,488.03
Travel & Transp.	79.20
Communications	1.40
Rents	836.80
Contractual Services	14.52
Supplies & Materials	3,359.13
Equipment	518.34
Total	\$24,297.42

TABLE 2

**SUMMARY OF RIBES ERADICATION
GLACIER NATIONAL PARK, 1952**

Area	Working	Acres	Man-Days	Ribes Species			Total Ribes	Spray Gallons	Per Acre	
				Ribes lacustre	Ribes viscosissimum	Ribes setosum			Man-Days	Ribes
Park Headquarters	Other	210	240		2,000	1,000	3,000		1.14	14
Lake McDonald	Other	440	50	1,000			1,000		.11	2
Oldman Lake	Second	320	710	64,000	1,000	2,000	67,000	4,110	2.22	209
Total	All	970	1,000	65,000	3,000	3,000	71,000	4,110	1.03	73

Chemical work included above:

Area	Working	Acres	Man-Days	Spray	
				Gallons	
Oldman Lake	Second	50	260	4,110	

TABLE 3

**SUMMARY OF RIBES ERADICATION
GLACIER NATIONAL PARK, 1939-1952**

Area	Working				Man-Days	Ribes	Per Acre	
	First Acres	Second Acres	Other Acres	Total Acres			Man-Days	Ribes
Park Headquarters	690	620	910	2,220	1,270	134,000	.57	60
Two Medicine	710	680	850	2,240	2,720	323,000	280	1.21 144
Lake McDonald	1,780	1,780	1,780	5,340	3,230	165,000	.60	31
East Glacier	440	390	620	1,450	3,020	321,000	60	2.08 221
Oldman Lake	1,520	470		1,990	4,190	436,000	7,560	2.11 219
Total	5,140	3,940	4,160	13,240	14,430	1,379,000	7,900	1.09 104

Chemical work included above:

Working	Acres	Man-Days	Spray	
			Gallons	
First	120	460	3,300	
Second	90	290	4,260	
Other	90	120	340	
Total	300	870	7,900	

TABLE 4

**STATUS OF BLISTER RUST CONTROL, 1952
GLACIER NATIONAL PARK**

Area	Control Unit Total Acres	Maintenance Acres	Work Required		
			Initial Acres	Rework Acres	Post Check Acres
Park Headquarters	690	620		70	
Two Medicine	710	550		20	140
Lake McDonald	1,780	1,590			190
East Glacier	440	320			120
Oldman Lake	1,520	480		1,040	
Total	5,140	3,560		1,130	450

BLISTER RUST CONTROL, YELLOWSTONE NATIONAL PARK, 1952

By

J. C. Gynn, Area Leader

C. M. Chapman, District Leader

The Yellowstone National Park white pine blister rust control area was increased 3,500 acres by an addition to the Mount Washburn unit. The 1952 program consisted of initial ribes eradication in the new area and maintenance work in the Mammoth Hot Springs unit.

In conjunction with National Park Service officials, a blister rust control roadside exhibit was prepared by the Bureau of Entomology and Plant Quarantine. A rustic display case is being made by the Park to be ready for use in 1953. The display will be installed in the Mount Washburn control area at Dunraven Pass adjacent to the heavily used Tower Falls-Canyon Highway.

Colored 35 mm. slides showing step by step procedures in the use of chemical equipment and procedures reduced training costs. Follow-up illustrated evening lectures on other phases of the work and National Parks forestry problems created enthusiasm and interest among the crew.

Mount Washburn Extension. Acres worked, 400; man-days, 990; ribes removed per acre, 870; acres treated chemically, 150; gallons of spray, 9,850. A superintendent, a checker, and 23 crewmen, augmented by the Mammoth crew during the training period, were used for the work. Training started June 17 from the Canyon Utility area. The men traveled by truck to Dunraven Pass, then walked to the job, until July 24, when a pack camp on the work area was ready for occupancy. Work terminated September 4. Accomplishments were less than anticipated. Inclement weather and fire fighting hindered the work. Pack camp site improvements and trail construction, while limiting accomplishments in 1952, will increase production in 1953. All effective man-days were spent eliminating heavy ribes concentration in the eastern portion of the area.

A portable power sprayer using 2,4,5-T was employed to treat ribes concentrations in both stream and upland types. Greater production at reduced costs was achieved. A four-man crew easily moved the machine from one station to another. The unit was equipped with 800 feet of 3/8-inch main-line hose and 600 feet of 1/4-inch laterals. All hose was cut to easily-carried lengths and equipped with interchangeable snap-on connections.

Hi-Fog guns with 2,4,5-T were used to treat ribes concentrations on slopes where a water supply for the power unit or trombone pumps was not readily available. The one-man dragline system was used to remove scattered bushes where chemical methods were not practical.

Mammoth. Acres worked, 810; man-days, 230; ribes removed per acre, 21. A superintendent and seven crewmen worked with the Mount Washburn Extension crew until July 3. Fire fighting then delayed working in the Mammoth unit until July 11. All necessary work was completed by August 30. The 1952 maintenance work plan was based on 1950 post checking results. It was necessary to work more area than planned because of the high germination and survival of ribes seedlings since 1948. The ribes ranged from a few inches to 4 feet in height, this growth occurring since 1948. The rapid maturing of Ribes setosum as found in 1952 indicates maintenance work should be performed at shorter intervals to prevent any additional seed crop.

Checking and Control Status. All work done in the Mammoth unit during 1952 was placed in the post check category. After checking in 1953, the area will be reclassified and future maintenance work scheduled accordingly. Post checking 840 acres in the Mount Washburn unit showed 460 acres as requiring additional work and 380 acres meeting maintenance standards. All area worked in the Mount Washburn Extension was classified for rework because of the original heavy ribes population and the difficulty of determining chemical results until the year following treatment. Table 4 shows control status classification for all units in Yellowstone National Park.

RECOMMENDATIONS

Craig Pass. No additional work needed for several years.

Mammoth. All necessary post checking should be performed in 1953 and a future maintenance work schedule made accordingly.

Mount Washburn. Scheduled maintenance work as determined by the post check and control status classifications should be performed in 1953. To accomplish the work, a superintendent (GS-6) and 10 crewmen should be employed for a 3-month period beginning June 8 or as soon thereafter as possible.

Mount Washburn Extension. Initial ribes eradication work should be continued as planned. It is recommended a superintendent (GS-6), a checker (GS-5), and 23 crewmen be employed as in 1952 to continue the work. Training should begin June 8 or as soon thereafter as possible at the Canyon camp with the Mount Washburn crew. The pack camp should be installed in the Extension area as soon as conditions permit. Work should continue from there until September 15. As planned by the National Park Service, a power sprayer should be purchased to supplement one now on temporary loan from the Bureau of Entomology and Plant Quarantine.

If possible, camp superintendents should report several days early to organize equipment and make field preparations for training. Several additional men should be hired at the start to take care of man-day losses from late arrivals, quits, fire suppression, and those leaving early. The above estimates are made on a 6-day work week.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date:

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952 YELLOWSTONE NATIONAL PARK

Item	National Park Service
Personal Services	\$23,308.80
Travel & Transp.	41.19
Communication Service	19.63
Contractual Services	1,273.44
Equipment	464.51
Supplies & Materials	4,277.27
Salary, Checker	1,061.51
Total	\$30,446.35



TABLE 2

**SUMMARY OF RIBES ERADICATION
YELLOWSTONE NATIONAL PARK, 1952**

Area	Working	Acres	Man-Days	Ribes Species				Total Ribes	Spray Gallons	Per Acre		
				Ribes lacustre	Ribes setosum	Ribes cereum	Ribes montigenum			Man-Days	Ribes	
Mammoth	Other	810	230	5,000	8,000	4,000		17,000	160	.28	21	
Mount Washburn Extension	First	400	990	276,000				72,000	348,000	9,850	2.48	870
Total		1,210	1,220	281,000	8,000	4,000	72,000	365,000	10,010	1.01	302	

Chemical work included above:

Area	Working	Acres	Man-Days	Spray	
				Gallons	
Mammoth	Other	20	30	160	
Mt. Washburn					
Extension	First	150	540	9,850	
Total		170	570	10,010	

TABLE 3

**SUMMARY OF RIBES ERADICATION
YELLOWSTONE NATIONAL PARK, 1945-1952**

Area	Working				Man-Days	Total Ribes	Spray Gallons	Per Acre	
	First Acres	Second Acres	Other Acres	Total Acres				Man-Days	Ribes
Mammoth	1,580	1,480	960	4,020	2,040	216,000	2,950	.51	54
Mount Washburn	4,690	1,600	60	6,350	8,270	1,195,000	16,010	1.30	188
Craig Pass	3,320	60		3,380	420	26,000	40	.12	8
Mount Washburn Extension	400			400	990	348,000	9,850	2.48	870
Total	9,990	3,140	1,020	14,150	11,720	1,785,000	28,850	.83	126

Chemical work included above:

Working	Acres	Days	Spray	
			Man-	Gallons
First	550	1,730	25,740	
Second	340	350	2,340	
Other	60	100	770	
Total	950	2,180	28,850	

TABLE 4

STATUS OF BLISTER RUST CONTROL, 1952
YELLOWSTONE NATIONAL PARK

Area	Control Unit Total Acres	Maintenance Acres	Work Required		
			Initial Acres	Rework Acres	Post Check Acres
Mammoth	1,580	770			810
Mount Washburn	4,700	2,910	10	1,550	230
Craig Pass	3,320	3,260			60
Mount Washburn Extension	3,500		3,100	400	
Total	13,100	6,940	3,110	1,950	1,100

BLISTER RUST CONTROL, ROCKY MOUNTAIN NATIONAL PARK, 1952

By

J. C. Gynn, Area Leader
C. M. Chapman, District Leader

In 1952, maintenance work and second working in the south half of the Longs Peak-Estes Cone blister rust control unit were completed as planned. To a large extent success of the program can be attributed to a competent, experienced camp superintendent with good assistants employing the following techniques: Men best suited for each particular method of ribes eradication were intensively trained and used accordingly; good use and coordination of chemical methods and the one-man dragline system; and careful grouping of crewmen as to working speed and temperament. Because of interest and enthusiasm radiated by the overhead, very little personnel turnover occurred.

Ribes eradication. Acres second working, 1,600; man-days, 1,440; ribes removed per acre, 29; acres chemically treated, 300. A superintendent, a checker, and 24 crewmen were initially employed. Because extra men were hired at the start, the average recommended crew size was maintained throughout the season from June 16 to September 13. All doubtful areas were post checked and necessary re-work performed. Hi-Fog guns mounted on U. S. Army "Mountain" packboards were generally used for treating ribes with 2,4,5-T at the 10,500 to 12,000 ft. elevations and trombone pumps were used for treating ribes in stream type near Roaring Fork and above the Eugenia Mine along Inn Brook. The 1950 initial chemical work in these high rugged areas was very effective. As a result the 1952 chemical rework was completed on August 13, 3 weeks ahead of schedule. To reduce future costs, some maintenance work was performed ahead of schedule in remote areas by crews doing second working in the vicinity. A few live ribes root crowns remaining where numerous ribes among dense prostrate white pine and fir had been initially sprayed in 1950, were found and removed. In nearly all cases the original root system had rotted and the small roots supporting sprouts were easily hand pulled. Areas where this occurred were covered very rapidly using the one-man dragline method.

A seven-man "batching" camp was installed in Jim's Grove above 11,000 ft. elevation in the immediate vicinity of remote work areas. Over 130 man-days were saved by eliminating the long and exhausting daily climb from the Longs Peak campground. Crews using the camp were rotated as required by the method of ribes eradication being employed. The camp was later moved to the head of Inn Brook. The "batching" camp proved highly successful resulting in increased production. The more accessible portions of the area were reached by truck from the Park Utility Area and walking to the job from nearest road point.

Checking and control status. All areas were checked immediately following working and were mopped up when necessary. A final check showed very efficient work. Most 1952 work areas will remain in the post check category until chemical results can be determined by future surveys. Table 4 shows control status classifications of the entire unit.

RECOMMENDATIONS

In 1953, all scheduled second working should be completed in the north portion of the control unit. Ribes intermingled with prostrate white pine and fir chemically treated in 1951 should be checked and necessary rework performed.

It is recommended that a superintendent GS-6, a checker GS-5, and 22 men be employed for the work for a 3-month period beginning June 15. Several additional men should be hired at the start to make up man-day losses caused by rain, fire, discharges, and men leaving early. The above estimates are made on the basis of a 6-day work week.

RESULTS

The following tables show expenditures, results of the 1952 field work, and accumulative results of work performed to date:

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1952 ROCKY MOUNTAIN NATIONAL PARK

Item	National Park Service
Personal Services	\$22,876.00
Travel & Transp.	36.00
Rents	526.00
Contractual Services	472.00
Supplies & Materials	1,798.00
Salary, Checker	596.00
Total	\$26,304.00

TABLE 2

SUMMARY OF RIBES ERADICATION
ROCKY MOUNTAIN NATIONAL PARK, 1952

Area	Working	Acres	Man-Days	Ribes Species				Total Ribes	Spray Gallons	Per Acre	
				Ribes setosum	Ribes cereum	Ribes coloradense	Ribes montigenum			Man-Days	Ribes
Longs Peak-Estes Cone	Second	1,600	1,440	20,000	3,000	2,000	21,000	46,000	830	.90	29

Chemical work included above:

Working	Acres	Man-Days	Spray Gallons
Second	300	550	830

TABLE 3

SUMMARY OF RIBES ERADICATION
ROCKY MOUNTAIN NATIONAL PARK, 1950-1952

Area	Working			Man-Days	Ribes	Spray Gallons	Per Acre	
	First Acres	Second Acres	Total Acres				Man-Days	Ribes
Longs Peak-Estes Cone	6,100	1,730	7,830	5,660	364,000	9,450	.72	46

Chemical work included above:

Working	Acres	Man-Days	Spray Gallons
First	470	1,540	8,550
Second	310	560	900
Total	780	2,100	9,450

TABLE 4

STATUS OF BLISTER RUST CONTROL, 1952
ROCKY MOUNTAIN NATIONAL PARK

Area	Control Unit Total Acres	Maintenance Acres	Work Required		
			Initial Acres	Rework Acres	Post Check Acres
Longs Peak-Estes Cone	6,100	3,780		640	1,680

DEVELOPMENTAL WORK IN METHODS OF RIBES ERADICATION, AND PROGRESS OF RIBES ECOLOGY AND DISEASE CONTROL STUDIES IN THE NORTHWESTERN PROJECT FOR 1952

By

V. D. Moss, Forest Ecologist. R. T. Bingham, Pathologist;
and J. F. Breakey, Pathologist

SUMMARY OF D&I PROJECT WORK FOR 1952

Personnel and assignments

Personnel in the Developmental and Improvement Project and their activities in blister rust control for 1952 are: Moss, development and improvement of physical, chemical, and mechanical methods of blister rust control, and ribes ecology in relation to ribes eradication work and white pine management; Bingham, development of rust resistant white pine, blister rust damage surveys in mature western white pine stands, and effectiveness of control on areas worked to maintenance standards; and Breakey, adaptation and improvement of all types of equipment used in control operations.

Chemical control of ribes and cankers

Developmental work in the use of chemicals for blister rust control work included (a) checking results of herbicides tested on ribes in 1951, (b) establishing tests comparing the effectiveness of various esters of 2,4,5-T, testing new formulations of 2,4,5-T, evaluating adjuvants as sticker-spreader-penetrants for aqueous solutions of 2,4,5-T, and (c) testing chemicals on infected white pine for canker elimination.

Tests in 1951 evaluating adjuvants as sticker-spreader-penetrants for aqueous solutions of 2,4,5-T showed that two of the most satisfactory were summer oil emulsion and Multi-film L. The latter is a mixed soluble oil of light consistency and stable with changing temperature. Although it does not mark spray solution as well as the summer oil emulsion, Multi-film L is easier to use under field conditions and cheaper per gallon of spray solution when used at the recommended strength of 0.1 percent. Some adjuvants were found satisfactory as sticker-spreader-penetrants but objectionable physically because of coagulation when chilled. For the trombone pump and Hi-Fog gun sprayers, the mixture of 1 percent summer oil emulsion and .1 percent propylene glycol is recommended. In lieu of this mixture, either summer oil emulsion or Multi-film L are satisfactory adjuvants for hand sprayers.

Respray treatment of resprouting Ribes viscosissimum and R. lacustre the first season after initial spray resulted in 100 percent bush kills with concentrations of 1,000 and 2,000 ppm a.e. 2,4,5-T. A disadvantage in treating resprouts the first year after initial spraying is the difficulty of locating them when they have just the one season live stem growth. It is far better to wait until the second year when resprouts will be taller and will have more foliage. At this time seedlings that germinated the first year after spraying can be treated along with resprouts. 2,4,5-T should be employed at a concentration of 2,000 ppm a.e. for spraying resprouts and each ribes crown must be thoroughly drenched.

Tests were instituted this season to compare the effectiveness of the several types of proprietary 2,4,5-T esters to insure the best available formulations for blister rust control. Nine proprietary ester formulations of 2,4,5-T were tested at three concentrations and three dosage rates.

The control operations have been advised in a few cases to continue applying aqueous spray solutions of 2,4,5-T later in the fall season than normally recommended for obtaining the best kill of ribes. These late season sprayings have been confined to areas of heavy ribes populations more for the purpose of knocking down live stem and opening the areas for respray treatment than trying to secure a high bush kill. By employing heavy dosages, some of these late sprayings have resulted in much higher bush kills than was anticipated. To learn more of the effectiveness of late season spraying, a series of tests were started August 28 and continued at weekly intervals ending September 25 which was well after the occurrence of killing frosts. At the beginning of this period, ribes were commencing to defoliate and by September 25 only a few leaves were being held near the tips of branches.

Tests started in 1951 to evaluate adjuvants as sticker-spreader-penetrants for aqueous solutions of 2,4,5-T were continued in 1952. As adjuvants appear to increase the effectiveness of aqueous solutions of 2,4,5-T, new materials as they become available will be field tested.

Canker control by chemicals

Results of testing various chemicals on infected white pine for canker control are not encouraging enough to warrant aircraft spray experiments. None of the chemicals were found to be translocated in lethal amounts from healthy to infected branches. Chemicals which were the most effective for killing cankers when applied as a foliage spray by the trombone pump were acti-dione in combination with 2,4,5-T. Tests of new chemicals on infected white pine in 1952 included alpha naphthaleneacetic acid and 2,4,6-trichlorophenoxyacetic acid. In addition, tests were made comparing two concentrations of acti-dione, one applied with the trombone pump and the other with the Hi-Fog gun.

Ribes ecology

Soil disturbance plots were established in 1951 to determine (a) the effect of 2,4,5-T spray on the viability of stored ribes seed, (b) the potential ribes seedling problem related to number of years after clear-cutting and prescribed broadcast burning, and (c) the potential ribes seedling problem in partial cutting areas at the time of second cutting. The results of soil disturbance plots on sprayed and unsprayed area gave no indication that the amount of 2,4,5-T spray being applied has any affect on the viability of stored ribes seed. On areas clear-cut and prescribed broadcast burned, stored ribes seed are devitalized in a period ranging from 5 to 15 years after burning, depending on security of site. In partial cutting areas, the amount of viable ribes seed decreases, depending upon the volume of residual timber and the length of time until second cutting.

Improvement of equipment

A major contribution in the development and improvement of chemical and mechanical equipment for blister rust control was made by J. F. Breakey in the design and

construction of a lightweight back-pack power sprayer with a collapsible canvas mixing tank. This unit will make possible power spraying of difficult ribes populations in locations not accessible to truck or tractor power sprayers. The collapsible canvas tank for mixing chemical spray solution has a capacity of about 200 gallons.

A device for accurately measuring the length of string line laid in marking area boundaries for ribes eradication was designed and constructed by Breakey. This distance recording string layer will greatly facilitate the work of checkers in establishing boundary lines. Additional work was undertaken this year in the development and improvement of truck and tractor power sprayers and in standardizing such accessories as hozes, couplings, and nozzles.

Breeding rust resistant white pine

Work in the development of rust resistant western white pine entered the third active season and included (1) locating new rust resistant selections, (2) maintaining outplantings containing grafts of resistant selections, (3) controlled pollinations among resistant selections, (4) collecting seed from the 1951 controlled pollinations, (5) growing seedlings of controlled crosses among resistant selections, (6) making trial blister rust inoculations on resistant tree and other young seedlings, and (7) preparing an article, "Breeding Blister Rust Resistant Western White Pine," now accepted for publication by the Journal of Forestry.

Four new selections were found, bringing the total to 70. Grafting work was done to replace grafts lost in field plantings and must continue next year to replace relatively heavy 1952 drought losses among outplanted grafts. Eighty-six controlled pollinations were made among various pairs of resistant selections. In 1952, work was concentrated on crossing pairs of trees with similar form and vigor characteristics, and on making self-pollinations. Seed from the 33 pollinations attempted in 1951 were collected. Twenty-five of the thirty-three attempted pollinations produced an adequate number of sound seed for progeny trials beginning in 1953. In 1952, progeny testing involving 99 lots of seed from controlled and wind pollinations was begun at a special nursery in Spokane. Plantings were generally successful and produced in almost all cases a number of seedlings adequate for resistance progeny testing. The Division of Forest Pathology began active field work in this cooperative project, making trial exposures of 1-0 nursery seedlings to blister rust. It is hoped that resistant tree seedling progenies now in the Spokane nursery can be inoculated both as 1-0 and 2-0 seedlings, thus reducing the time required for resistance testing by about 2 years.

Rust Development on a Maintenance Area

During the late fall of 1951 and summer of 1952, a major, permanent plot was established to study the development of blister rust on areas now in maintenance control status. The plot (initiated jointly by survey crews of supervisory personnel from Bureau operations and D&I projects) is a grid of sample lines covering a 6 square mile maintenance area near Elk River, Idaho. New rust development will be followed on some 1,250 trees adjacent to 249 designated stations. From this study it is expected that rust developing from the few ribes remaining on the

maintenance area can be appraised and maintenance standards raised or lowered as seems necessary. It is hoped that any long distance spread of rust from heavier ribes concentrations outside the maintenance area can also be measured by examining for gradients in rust intensity along the sample lines of the grid.

Damage to mature pine on the Clearwater National Forest

Blister rust damage in young mature stands on the North Fork of the Clearwater River may be of equal or greater intensity than reported for the St. Joe National Forest last year. A preliminary damage survey in Skull Creek, Canyon Ranger District, revealed that of 14 mature trees inspected, all had lethal blister rust cankers. Flagging of the tops of these mature trees should occur in 25 to 30 years.

DEVELOPMENT AND IMPROVEMENT OF PHYSICAL, CHEMICAL, AND MECHANICAL METHODS OF BLISTER RUST CONTROL

Results of herbicides tested on ribes in 1951

The results of evaluating adjuvants as an effective sticker-spreader-penetrant agent for aqueous solutions of 2,4,5-T are shown in table 1. These data are the highest percent bush kills attained in applying the different spray formulae before and after August 1 to R. viscosissimum and R. lacustre. About August 1 or shortly after, the growth processes of ribes begin to slow down, causing them to become more resistant to aqueous solutions of 2,4,5-T than earlier in the season when actively growing.

In these tests, plots received 1 gallon of spray solution per milacre regardless of numbers, age, and size of ribes, or character of habitat. The dosage rate was kept uniform to permit a measure of the influence of adjuvants in increasing the effectiveness of aqueous solutions of 2,4,5-T. If it had been adjusted to compensate for plot variables, a more uniform bush kill would have resulted, especially in treating R. lacustre because this species is more resistant to 2,4,5-T than R. viscosissimum. Experience has shown that large volumes of spray solution must be employed in crown drenching R. lacustre to obtain a satisfactory bush kill because of its nature to form multiple crowns and layering stems.

An aqueous solution of 2,4,5-T unmodified by spreader-sticker when applied to ribes tends to form in loose droplets which are easily shaken from the foliage. These tests and past experience show that most adjuvants of this type will increase the effectiveness of aqueous solutions of 2,4,5-T applied to ribes.

Adding 1 percent by volume of summer oil emulsion to aqueous solutions of 2,4,5-T provides a satisfactory sticker-spreader-penetrant and a marker. At this rate its disadvantages are bulk and costs of about one-half cent per gallon of spray solution. In 1952, for spring and summer spray operations the volume of summer oil emulsion was lowered to .5 percent of the aqueous solution of 2,4,5-T to reduce costs of chemical spray treatment.

Tween #20 proved to be a good wetting agent but of little or no value as penetrant or in lowering the rate of evaporation of spray solution from the foliage of ribes.

Multi-film L, a mixed soluble type oil of light consistency and stable with changing temperature, was comparable to summer oil emulsion as a satisfactory sticker-spreader-penetrant for aqueous solutions of 2,4,5-T. Multi-film L has some advantages over summer oil emulsion as an adjuvant in that it is easier to pour, measure, and mix in spray solution, it requires less volume than summer oil emulsion, 0.1 percent compared to 1 percent, and costs less per gallon of spray solution. Multi-film L costs \$3.25 per gallon, enough for 1,000 gallons of spray solution. Summer oil emulsion costs \$0.50 per gallon, enough when used at the rate of 1 percent by volume for 100 gallons of spray solution. A disadvantage of Multi-film L is that it does not provide as satisfactory a marker as summer oil emulsion. In 1953, Multi-film L will be recommended for practical spray operations in a pilot test to compare it with summer oil emulsion as an adjuvant for aqueous solutions of 2,4,5-T.

Triton B-1956 was not a good wetting agent. It is difficult to handle when chilled as it coagulates in mixture with 2,4,5-T esters at low temperature.

Triton X-45 and Triton X-100 both were satisfactory as a sticker-spreader-penetrant for aqueous solutions of 2,4,5-T but like Triton B-1956 they are a nuisance to handle when chilled.

Oil emulsion combined with propylene glycol is a very desirable adjuvant for aqueous solutions of 2,4,5-T applied with the trombone pump or Hi-Fog gun. In addition to what oil emulsion has to offer as a spreader-marker, propylene glycol provides pump lubrication and helps to reduce rate of evaporation of spray solution from foliage of ribes. Propylene glycol at 0.1 percent by volume is as satisfactory as the 0.5 percent and 1 percent solutions when combined with the 1 percent summer oil emulsion.

Respray treatment of resprouting R. viscosissimum and R. lacustre proved 100 percent effective both with concentrations of 1,000 and 2,000 ppm a.e. 2,4,5-T. These resprouts were sprayed about midseason the first year after initial spray treatment.

TABLE 1

RESULTS OF TESTS EVALUATING VARIOUS ADJUVANTS AS STICKER-SPREADER-PENETRANTS FOR AQUEOUS SOLUTIONS OF 2,4,5-T^{1/}

Treatment	Pasis No. Plots	AE. 2,4,5-T Ppm	Highest Percent Bush Kill Attained				Adjuvants Percent by Volume	
			Before Aug. 1		After Aug. 1			
			visc.	lac.	visc.	lac.		
Initial Spray	4	1,000		21	67	37	None	
	4	2,000		12	88	86	"	
	10	1,000	71	95	71	100	Oil emulsion	
	9	2,000	90	72	100	87	" " 1%	
	4	1,000		20	79	67	Tween #20	
	4	2,000		100	100	82	" " "	
	5	1,000	100	33	67	50	Tween #20 .5%	
	5	2,000	100	67	100	71	" " "	
	3	1,000		25	92	67	Multi-film L	
	3	2,000		45	100	100	" " " "	
	2	1,000			100	67	Multi-film L .5%	
	4	2,000	92	100	89	87	" " " "	
	3	1,000		8	93	0	Triton B-1956	
	3	2,000		57	94	37	" " "	
	3	1,000	89		91	67	Triton B-1956 .5%	
	4	2,000	100	80	70	100	" " "	
	3	1,000		8	69	0	Triton X-45	
	3	2,000		60	100	33	" " "	
	4	1,000	89	100	75	86	Triton X-45 .5%	
	4	2,000	100	50	100	100	" " "	
Respray	3	1,000		83	94	57	Triton X-100	
	3	2,000		100	100	75	" " "	
	4	1,000	100	0	92	100	Triton X-100 .5%	
	3	2,000	100		96	100	" " "	
	3	1,000		80	94	9	Oil emulsion 1%	
	3	2,000		100	100	43	+ Propylene glycol .1%	
	5	1,000	71	100	100	12	Oil emulsion 1%	
	5	2,000	100	100	100	75	+ Propylene glycol .5%	
	2	1,000	100	100			Oil emulsion 1%	
	2	2,000	100	100			" " "	

^{1/}Stantox T-45 and Weedone 2,4,5-T

Herbicides tested on ribes in 1952

Plots were established in drainages of the following national forests: LaClerc Creek, Kaniksu; Honey Creek, Coeur d'Alene; and Graves Creek, St. Joe.

Tests were made principally on R. lacustre as this species is more resistant to 2,4,5-T than R. viscosissimum. Chemical was prepared as an aqueous solution and applied as a foliage spray with the trombone pump sprayer.

The purpose of the tests was to determine the effectiveness of various esters of 2,4,5-T, the effectiveness of an equal acid content of 2,4,5-T applied at various dosage rates, the effectiveness of aqueous spray solutions of 2,4,5-T applied late in the fall season, and to continue studies instituted in 1951 of testing adjuvants as a sticker-spreader-penetrant agent to increase the effectiveness of 2,4,5-T.

Plots established to compare the effectiveness of the various esters of 2,4,5-T and to compare various dosage rates are listed in table 2. The identical esters were tested where they differed by manufacturer.

TABLE 2

RECORD OF TESTS OF VARIOUS ESTERS OF 2,4,5-T^{1/} AND
DOSAGE RATES OF AQUEOUS SPRAY SOLUTIONS

Trade Name or Code Number for the Product	Type of Ester ^{1/}	Plots No.	Dates of Treatment	AE. 2,4,5-T Ppm 1,000	Dosage Rate Per Milacre Gallons
ACP-L-129	butoxy ethanol 2,4-D	7	7/1, 7/30, 8/14, 9/3	2 & 4	1, 1½, & 2
Stull's Brush Killer #3	isopropyl 2,4,-D & 2,4,5-T	6	7/1, 7/30, 8/14	1, 2, & 4	"
ACP-L-120	emulsifiable acid	6	7/1, 7/30, 8/18, 9/3	1, 2, & 2½	"
ACP-L-329	butoxy ethanol 2,4,5-T	6	7/1, 7/30, 8/18, 9/3	"	"
Dow Esteron 245	propylene glycol butyl ether	6	7/2, 7/30, 8/18, 9/3	"	"
ACP Weedone 2,4,5-T	butoxy ethanol	6	7/2, 7/31 8/18, 9/3	"	"
Pittsburgh Brush Killer Lo-Vol 4	tetrahydrofurfuryl	6	7/2, 7/31, 8/18, 9/3	"	"
Cal-Spray Co. Estericide, T-4	tetrahydrofurfuryl	6	7/2, 7/31, 8/18, 9/3	"	"
Colorado 44	isopropyl	2	7/2	"	1½

^{1/} 2,4,5-T and an ester unless otherwise noted

To determine how late in the fall season aqueous solutions of 2,4,5-T can be applied effectively as foliage spray, five replications of tests on R. lacustre were made starting August 28 and continuing at weekly intervals ending September 25. In this study a tetrahydrofurfuryl ester (with an acid equivalent of 4 lbs. 2,4,5-T per gallon) was applied at the rate of 1½ gallons of spray per milacre and each concentration of 2,500 ppm a.e. Six series of late season tests were made with 2,4,5-T comparing no adjuvant in the aqueous solution with 1 percent by volume of summer oil emulsion, 0.1 percent and 0.5 percent Tween #20, and 0.1 percent and 0.5 percent Multi-film L. Plots were established and sprayed on August 28, and September 4, 11, 18, and 25. These plots were established in Honey Creek, Coeur d'Alene National Forest.

Tests started in 1951 to evaluate adjuvants as sticker-spreader-penetrants for aqueous solutions of 2,4,5-T were continued this season with the establishment of plots in LaClerc Creek, Kaniksu National Forest. Tests were made on both ribes species using Weedone, a butoxy ethanol ester having an acid equivalent of 4 lbs. 2,4,5-T per gallon of proprietary material. Chemical solution was applied at the rate of 1½ gallons per milacre and in concentration of 2,000 ppm a.e., 2,4,5-T. Tests were made of 2,4,5-T comparing no adjuvant in the aqueous solution with 0.5 percent summer oil emulsion, 0.1 percent Multi-film L, 0.1 percent Triton X-45, 0.1 percent Triton X-100, and 0.1 percent Tween #20. The six plots were sprayed August 19.

Results of chemicals tested on infected white pine in 1951

The infected white pine trees sprayed with chemical solutions in 1951, Solitaire Creek, Coeur d'Alene National Forest, were inspected in September 1952, to determine the results in killing cankers. Cankers were tallied as dead only if the limb had been killed and the margin of canker discoloration was no closer than 1½ inches from live bark tissue. In any questionable case, such as the apparent death of the canker but not of the limb, cankers were recorded as live and noted for re-inspection in 1953. Trunk cankers are not included in results of tests for it requires about 2 years following treatment before the effects of chemicals on canker development can be ascertained.

A discussion of methods pertaining to the establishment of chemical tests occurs on pages 84 to 87 in the 1951 annual report for the Northwestern Project. The list of chemical treatments and the resulting percent of limb cankers killed are shown in table 3. The basis for each test is five infected trees, each having three or more limb cankers.

Untreated infected trees selected as checks were found to have an average of 18 percent of the limb cankers dead from natural causes.

TABLE 3
PERCENT OF LIMB CANKERS KILLED IN APPLYING CHEMICALS
TO WHITE PINE TREES INFECTED WITH BLISTER RUST

Date of Treatment
June 25-29 August 21-23

<u>Chemical Formulations</u>	<u>Ppm AE.</u>	<u>%</u>	Limb Cankers Killed
Zinc ethylene bisdithiocarbamate	500	31	None
	1,000	33	Treated
	2,000	14	
	4,000	35	
F. 1112 (zinc salt 2,4,5-trichlorophenol)	500	41	
	1,000	13	
	2,000	22	
	4,000	28	
Dowicide-B (sodium trichlorophenate)	500	35	
	1,000	11	
	2,000	22	
	4,000	19	
Methasan (zinc dimethyl bisdithiocarbamate)	500	15	
	1,000	18	
	2,000	13	
	4,000	17	
F-1000 (zinc salt 2,4,5-trichlorophenol)	500	24	
	1,000	11	
	2,000	26	
	4,000	14	
Dowicide-G (sodium pentachlorophenate)	500	17	
	1,000	35	
	2,000	15	
	4,000	39	
DN-111 (dinitro-o-cyclo-hexylphenol)	500	40	
	1,000	15	
	2,000	31	
Bioquin-1 (copper 8-quinolinolate)	500	25	
	1,000	56	
	2,000	28	
Dichloro diphenyl thiophene	500	27	
	1,000	30	
	2,000	48	
4,cyclohexyl-2,6-dinitrophenol	500	41	
	1,000	45	
	2,000	21	

TABLE 3 (contd.)

PERCENT OF LIMB CANKERS KILLED IN APPLYING CHEMICALS
TO WHITE PINE TREES INFECTED WITH BLISTER RUST

Date of Treatment
 June 25-29 August 21-23

<u>Chemical Formulations</u>	Ppm AE.	Limb Cankers Killed	%
DN-289 (dichloro diphenyl thiophene)	500 1,000 2,000 4,000	22 17 38 18	
Dithane D-14 (disodium ethylene bis-dithiocarbamate)	500 1,000 2,000 4,000	28 51 37 17	
Acti-dione, no adjuvant	5 10 20 40 80	52 35 31 26 62	33 34 22 27 15
Acti-dione + Tween #20, .1%	5 10 20 40 80	31 60 63 81 78	38 39 31 61 57
Acti-dione + Triton X-45, .1%	10 20	76 73	63 60
Acti-dione + Triton B-1956, .1%	10 20	48 32	28 43
Acti-dione + Multi-film L, .1%	10 20	62 50	25 41
Acti-dione + oil emulsion 1% & propylene glycol .1%	10 20	40 33	43 19
Actidione + oil emulsion 1% & propylene glycol .5%	10 20	53 57	46 54

TABLE 3 (contd.)

PERCENT OF LIMB CANKERS KILLED IN APPLYING CHEMICALS
TO WHITE PINE TREES INFECTED WITH BLISTER RUSTDate of Treatment
June 25-29 August 21-23

<u>Chemical Formulations</u>	<u>Ppm AE.</u>	<u>%</u>	Limb Cankers Killed
Acti-dione + Tween #20 .1% & 1,000 ppm AE. 2,4,5-T	10 20	51 47	33 63
Acti-dione + Multi-film L .1% & 1,000 ppm AE. 2,4,5-T	10 20	65 79	50 65
Acti-dione + Oil emulsion 1% & 1,000 ppm AE. 2,4,5-T	10 20	75 73	62 87
Weedone 2,4,5-T	1,000	None treated	45
Acti-dione + oil emulsion 1% & 1,000 ppm AE. Weedone 2,4,5-T	10 20		62 87
ACP #904 (2,4,5-T)	1,000		55
Acti-dione + oil emulsion 1% & 1,000 ppm AE. ACP #904 (2,4,5-T)	10 20		74 87
ACP #965 (2,4,5-T)	1,000		44
Acti-dione + oil emulsion 1% & 1,000 ppm AE. ACP #965 (2,4,5-T)	10 20		74 92
ACP #908 (2,4,5-T)	1,000		49
Acti-dione + oil emulsion 1% & 1,000 ppm AE. ACP #908 (2,4,5-T)	10 20		55 85

The following data are results of wrapping infected branches to protect them from spray solution in determining whether lethal amounts of chemical is translocated from healthy limbs to cause flagging of limbs infected with blister rust.

	<u>Ppm AE.</u>	<u>%</u>	
Acti-dione, no adjuvant	10 20	19 52	None treated
Acti-dione + Tween #20 .1%	10 20	23 8	26 18
Acti-dione + oil emulsion 1% & 1,000 ppm AE. 2,4,5-T	10 20	None treated	20 40

On the basis of these translocation tests, results are not encouraging enough to warrant aircraft spray experiments. The highest percent of limb cankers killed was with acti-dione in combination with 2,4,5-T but these chemicals are not consistently translocated in lethal amounts from healthy to infected branches. It is doubtful whether any chemical will have much value in the control of blister rust infection on white pine unless it is easily absorbed and translocated by the tree. This conclusion assumes that aircraft represents the only practical means of applying spray solution to infected white pine.

Chemicals tested on infected white pine in 1952

Two additional chemicals were added to the list of those being tested on infected white pine for killing cankers. These were alpha naphthaleneacetic acid at concentrations of 100, 300, and 500 ppm, and 2,4,6-trichlorophenoxyacetic acid as a triethanolamine salt at a concentration of 500 ppm. The two chemicals were applied separately, together, and in combination with acti-dione. Tests were located and made identical to those previously established in Solitaire Creek, Coeur d'Alene National Forest. Aqueous solutions of the chemicals were prepared in 2-gallon lots and applied uniformly to five trees.

Tests were made in the Clearwater Forest comparing two concentrations of acti-dione, one applied with the trombone pump sprayer and the other with the Hi-Fog gun. Plots are located in the Hildebrand drainage in a stand of natural reproduction 10 to 15 years old. They are one-twentieth acre in size. Those sprayed with the trombone pump received a dosage of 2 gallons, and those sprayed with the Hi-Fog gun a 1-gallon dosage. Chemical solution was applied as a foliage spray to all white pine trees within the plots. Plot No. 3 was established as a check.

<u>Chemical Formulation</u>	<u>Ppm</u>	<u>Plot No.</u>	<u>Date</u>
Solution applied with Trombone Pump			
Acti-dione + .1% Multi-film L	20	1	7/23
Acti-dione + .1% Multi-film L & 500 ppm a.e. 2,4,5-T	20	2	"
Solution applied with Hi-Fog Gun			
Acti-dione + .1% Multi-film L	100	4	"
Acti-dione + .1% Multi-film L & 500 ppm a.e. 2,4,5-T	100	5	"

RIBES ECOLOGY IN RELATION TO CONTROL WORK AND WHITE PINE MANAGEMENT

Longevity of stored ribes seed

Soil disturbance plots were established in 1951 to determine (a) effect of 2,4,5-T spray on the viability of stored ribes seed, (b) potential ribes seedling problem correlated with years after clear-cutting and prescribed broadcast burning, and (c) ribes seedling problem following second cuttings of partial cutting areas. Methods employed in establishing plots are discussed on pages 89 and 90 of the 1951 annual report for the Northwestern Project.

To determine the effect of 2,4,5-T spray on the viability of stored ribes seed, soil disturbance plots were established in areas of recent and older cuttings. In the area of recent cutting, ribes seedlings germinating from the logging disturbance had not yet produced new seed, but in the older cutting, ribes had been producing new seed over a period of 6 years. The number of ribes seedlings germinating on the soil disturbance plots established in the four areas sprayed with different concentrations of 2,4,5-T compared to the number germinating in the untreated check plots indicates that 2,4,5-T spray has little or no effect upon the viability of stored ribes seed.

<u>Plot Location</u>	<u>Ppm AE. 2,4,5-T</u>	<u>Ribes Seedling Per Acre</u>
Breakfast Creek	500	1,325
Clearwater Forest (1946 cutting)	1,000	674
	1,500	1,025
	2,000	1,375
	Check	650
South Fork Reed's Creek	1,000	43,500
Clearwater Forest (1941 cutting)	2,000	51,200
	3,000	89,800
	4,000	81,700
	Check	69,400

In the Diamond Creek drainage, Kaniksu National Forest, soil disturbance plots were established in 1951 to compare the potential ribes seedling problem on an area hand eradicated of ribes as against one chemically eradicated of ribes. These plots, located in an area clear-cut and prescribed broadcast burned in 1942, also afforded an opportunity to relate the longevity of stored ribes seed to years after burning. The soil disturbance plots were established along a ridge top where several thousand ribes per acre had been eradicated by hand and chemical methods. The 1952 check showed 111 seedlings per acre germinating from the soil disturbance on area hand eradicated of ribes. All of these germinated in a moist habitat at the head of a small draw. No seedlings were found on the chemically treated area. The fact that viable seed was found on an area hand eradicated of ribes and not one chemically eradicated of ribes does not, in this one example, furnish proof that the viability of stored ribes seed is affected by 2,4,5-T spray. On the upland proper, in the absence of ribes seedlings on the soil disturbance plots, observations indicate that in the 10 years since burning stored ribes seeds have been devitalized by high soil temperatures developing on the area. Exceptions would be any moist habitat such as in a draw or the protection afforded the ground beneath down timber.

The soil disturbance plots established in Lamb Creek and Bath Creek, Kaniksu National Forest, in an area snagged and prescribed broadcast burned did not expose viable ribes seed. A period of 13 years has elapsed since burning and the initial ribes were removed before producing new seed. The half-shade ecology plots in the Hannah area, Kaniksu National Forest, that were sown to ribes seed in 1940 and disturbed in 1951, failed to produce evidence that ribes seed is still viable.

To determine the potential ribes seedling problem likely to exist in partial cutting areas at the time of second cutting, soil disturbance plots were established in the Bear Paw, Kaniksu National Forest, in 1951. New seed production has been prevented on this area by the timely removal of ribes that originated from the disturbance caused by partial cutting. Therefore, any ribes seed germinating would represent the potential seedling population likely to develop at the time of second cutting. The area sampled was partial cut in 1937. Results of the 1952 check showed 85 ribes seedlings per acre as the present day potential seedling problem compared with 137 originally found after the 1937 cutting.

A PORTABLE POWER SPRAYER FOR BLISTER RUST CONTROL

The need for a lightweight portable power sprayer became evident during the 1950 and 1951 field seasons. In ribes control work by foliage spraying, where a large volume of dilute aqueous solutions of 2,4,5-T is needed for effective plant killing, many areas not readily accessible to truck-mounted sprayers have been difficult to spray effectively with knapsack units.

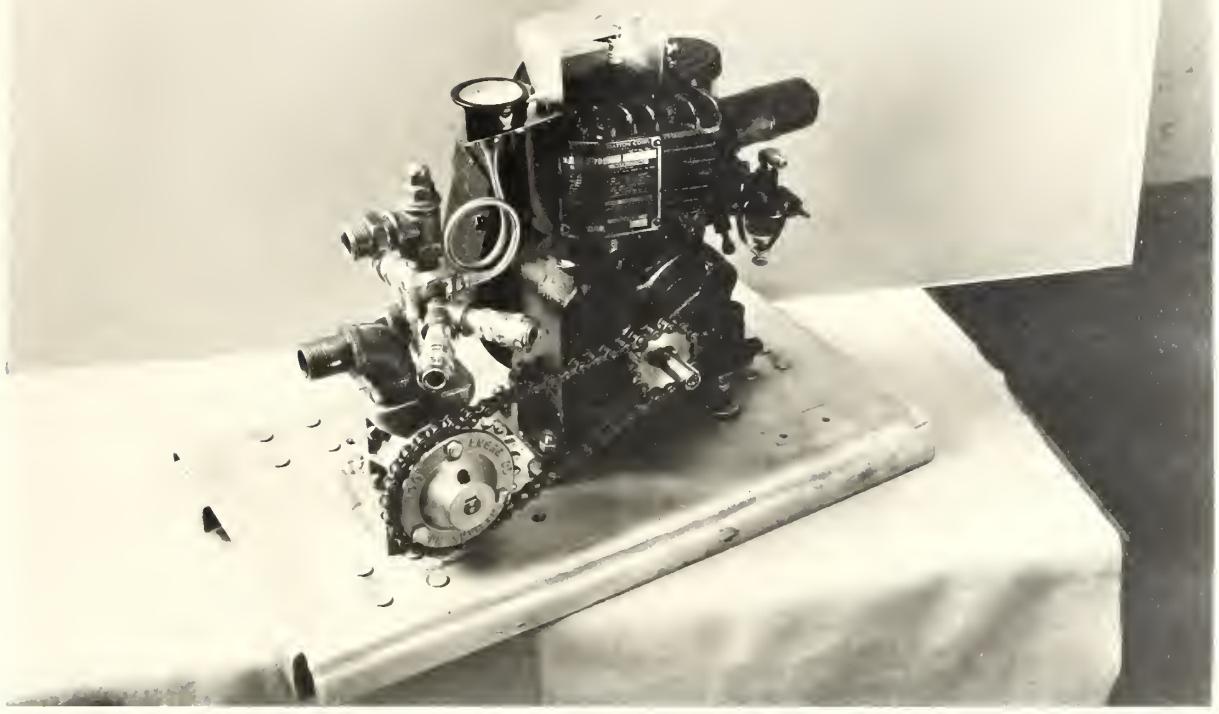
Studies of existing sprayers, which were begun in January 1952, indicated that at present manufacturers are not making lightweight portable power sprayers suitable for carrying into remote forest areas. There are many well-designed hand-operated garden and small orchard sprayers and field power sprayers, but only a limited number of portable power pumbers. The latter have been developed for fire fighting on lands that are without roads. They were found to be large volume pumps that are not readily adaptable to low volume high pressure spraying. Specifications for equipment and field objectives to be served were discussed by correspondence with the Bureau Special Equipment Center, Oklahoma City. Solution of these problems was further aided by a personal conference of Kenneth Messenger, Don Whittam, and Offord at Oklahoma City.

Northwest area leaders furnished general specifications for a portable sprayer that were considered desirable. Also the Pacific Coast Blister Rust Control Project suggested features that should be incorporated in the portable sprayer. The specifications agreed upon were: 6 g.p.m. at 200 p.s.i. maximum out-put using a 2½ to 3 hp gasoline engine. A folding tank of from 100 to 300 gallons capacity was required for spray storage and mixing. The weight of the portable power sprayer was not to exceed 60 pounds.

Sprayer using Briggs-Stratton Engine Model "8"

Principal components of the portable sprayer shown in W416 are the Briggs-Stratton air-cooled engine Model 8 and an ECO gearless pump. The fuel tank used was a 5-gallon G.I. blitz can fitted with outlet plug and shut-off valve. A 4-foot neoprene fuel line to engine carburetor was used. A 13-point engine sprocket and a 25-point pump drive gave a pump speed sufficient to produce 200 p.s.i. while delivering 6 gallons per minute. Engine governed speed was 2,800 r.p.m. For field tests the chain was fitted with a safety guard.

There was attached to the ECO gearless pump a specially constructed aluminum manifold. In this were inserted all accessories needed for the operation of the sprayer. The copper tubing between gauge and manifold furnishes an air cushion to resist shock. Hydraulic couplings were used for quick detachment of hoses.



W416

Portable pumper. Eco gearless sprocket drive pump size PP-2-m low volume, 3/4 port with manifold, by-pass, and pressure gauge. Briggs-Stratton model "8" engine, aluminum base, weight 60 pounds.



W647

Portable sprayer unit. Eco pump. Power Products Corp., engine model 315, sprocket drive using #41 chain and guard. Hose, nozzle, and canvas self-supporting 100-gallon tank. Weight 46 pounds.

They also act as shut-off valves. The base, or mounting plate, is three-sixteenths inch sheet aluminum. The edges are turned down on the plate for stiffness. There are three hooks on the underside for fastening to a pack-board.

Sprayer using Power Products Corporation Engine Model 315

This unit (W647) was assembled in an attempt to further reduce the weight of the sprayer. A 10-point engine sprocket and a 25-point pump drive were the drive assembly. The 2-cycle engine's governed speed was 3,600 r.p.m. The resulting pump speed of 1,450 r.p.m. was sufficient to produce 200 p.s.i. and deliver 6 g.p.m. The same model ECO pump was used as shown in W416.

Canvas self-supporting spray tank

W647 also illustrates the small 120-gallon open-topped canvas spray tank. W771, in the Cabinet Forest report, shows the 220-gallon partially closed top, self-supporting canvas tank. The smaller tank has a 45 inch diameter round bottom and the other a 57 inch diameter round bottom. Both are 30 inches in height. Each is coated with a paraffin base waterproofing solution.

Tank filler pump

A hydraulic ejector operating a vacuum pump from pressure line to sprayer was employed as a tank filler. A Penberthy Ejector No. 63 was fitted with a jet having a 1/8 inch orifice. Delivery to tank was through a 3/4 inch I.D. garden hose.

Comments on field performance of the portable power sprayer

Field operation of the portable sprayers has demonstrated that pressures of 200 p.s.i. can be maintained with a lightweight engine of $2\frac{1}{2}$ to 3 hp. This is enough to service three nozzlemen using Pecan guns that are equipped with No. 4 or No. 5 outlet orifices. Pressure drops are negligible. It is also evident that it is not necessary to depend on heavy piston-type pressure pumps. The small, oscillating rotor pump delivers 6 plus gallons at 200 p.s.i.

Oilproof rubber rotors (impellers) manufactured for agricultural sprayers must be used in the pumps. The regular Buna rubber and Micarta impellers did not give satisfactory service. When using Model PP-2M low volume ECO pump, the oil-proof rubber impellers should be a part of the unit. These are the 1-3/4 inch diameter impellers actuated by the high-lift cams. These pumps are manufactured by ECO Engineering Company, Newark, New Jersey. The cost of each portable sprayer was \$180.

The first of the special 220 gallon canvas tanks was equipped with drainage fittings and was used for camp water storage in a Kaniksu pack camp. It was placed on an elevated platform and proved satisfactory for this purpose. Soon afterward others having the same dimensions, but without the drainage fittings, were ordered for portable sprayer tanks. This type of canvas tank, shown in W771 Cabinet report, proved to be an effective unit in the field.

Field performance of the small portable sprayers has been excellent. Those employing the lightweight engines are the most desirable since they make it possible to move more quickly from each spray location. These sprayer units complete with canvas tanks should accelerate ground coverage in off-the-road control areas.

DEVELOPMENT OF RUST RESISTANT WHITE PINE, 1952

During 1952, cooperative work on the development of rust resistant white pine entered the third season of active field work. On the basis of previously prepared work plans and agreements among the Forest Service; Bureau of Plant Industry, Soils, and Agricultural Engineering; and the Bureau of Entomology and Plant Quarantine; the 1952 work was concerned with selection of rust resistant western white pine, grafting of selections, controlled pollination, nursery production of controlled pollinated resistant tree seedlings, and pilot tests in the artificial exposure of this F_1 progeny to infection by the blister rust pathogen. The progress that has been made in the completion of these tasks is given in the report that follows.

1. Selection work continues

Four apparently rust resistant western white pine selections were made in old, heavy rust centers in Randolph Creek, Cabinet National Forest, Montana, and at White Rock Springs, St. Joe National Forest, Idaho. This brings the total number of selections made to 70. All four new selections were included in 1952 controlled pollination work.

2. Grafting of selections

Grafting to propagate, protect, retest, and accumulate resistant selections continued in the greenhouse and field in the winter and spring of 1951-52. Some 500 grafts were attempted, either to include new selections among those being studied on graft outplanting plots, or to replace dead grafts among those already outplanted on the five established plots. Many of the grafts outplanted in 1951 produced vigorous new leader growth as shown in figure 1. The driest summer and fall of some 70 years, plus the fact that replacement grafts were usually among selections which graft and survive poorly, resulted in very low field survival (10-20 percent) among grafts outplanted in the spring of 1952. Many grafts which appeared to be well established following outplanting in the spring of 1951 put on several inches of new leader growth (figure 1) in the spring of 1952, then died from the prolonged drought. Considerable replanting is in store for the spring of 1953.

It is noteworthy that certain of the selections are difficult to graft. Of the 40-odd selections upon which grafting and other breeding work is being concentrated, almost one-quarter of them have shown just 10 to 20 percent survival in the field outplanting. The majority of the other selections grafted quite readily, field survival running between 50 and 75 percent. In western white pine the best scionwood seems to be provided by selections having long, vigorous internodes of current season wood in which to make grafting cuts. Some of the difficulty in grafting may therefore be laid to the short, low-vigor current season wood produced by certain selections. In other selections, fair scionwood is produced but grafted trees slowly die after field planting. The scions make good unions with the stocks in the grafting sweatboxes, yet the callus tissue of the graft apparently fails to transmit either mineral nutrients or elaborated foods. Root development in the stock plant is practically stopped, top development in the scion stands still, and the plant dies either from lack of water or food after one or more seasons pass. Additional work on grafting technique and on obtaining better

field survival is necessary, particularly since seed orchard establishment using grafted trees is proposed, if and when resistance of seedling progenies from resistant selections is established.

3. Controlled pollination work

Table 1 sums up the 1952 pollination work and all other pollination work to date. The 86 intraspecific and interspecific pollinations attempted by the three-man team F. I. Righter, A. E. Squillace, and Bingham during the 1952 season should about conclude the large-scale pollination work. The 179 attempted intraspecific pollinations should provide about 150 F_1 progenies for rust resistance testing. This number is probably adequate for determining heritability of rust resistance in the F_1 generation.

Table 1

Pollination Season	Controlled Pollinations			
	Number Attempted		Number Successful ¹ /	
	Intraspecific	Interspecific	Intraspecific	Interspecific
1950	83	8	74	4
1951	22	11	20	5
1952	74	12	(Not known until fall 1953)	
Totals	179	31	-	-

¹/ Produced sound seed adequate for 90-seedling progeny trials.

During 1952, special emphasis was placed on making all possible self-pollinations of resistant selections, and on pairing similar selections falling in certain phenotypic groups (i.e., wide-crowned, heavy-branched, persistent-branched group vs. narrow-crowned, fine-branched, self-pruned group, figures 2 through 5). The appraisal of these phenotypes and measurements of seedling progeny performance described in a later section of this report, are the particular province of the Northern Rocky Mountain Forest and Range Experiment Station, through their representative A. E. Squillace. The photographs and preliminary conclusions given in this paper are included in the hope they will stimulate discussion after distribution to cooperating and other interested agencies. Criticism and suggestions are welcomed since they will aid in the preparation of papers for publication.

Figures 2 and 3 illustrate Selections Nos. 59 and 24, trees falling in the narrow-crowned, fine-branched group, while figures 4 and 5 illustrate trees falling in the wide-crowned, coarse-branched group. Selections 59 and 64 are approximately 500 feet apart in the same stream bottom on Elk Creek near Elk River, Idaho; Selections 24 and 22 are approximately 300 feet apart on the toe of the same slope of Crystal Creek near Fernwood, Idaho.

Altogether, some 20 different self-pollinations have been attempted. Selfings are especially important to seed-orchard establishment wherein factors of natural selfing ability of individual selections, and the possible degenerative effects of such natural inbreeding must be considered. Furthermore, the mechanism of



Figure 1.

Field planted veneer graft of rust resistant WWP No. 29, 20 months after grafting. Good leader growth. Graft is well callused. In a few years the graft should disappear.

W731



Figure 2. W657
Rust resistant WWP No. 59 falling in the
narrow-crowned, fine branched group of
phenotypes. Cloth bags protect cones pol-
linated in 1951 and cloth streamers iden-
tify conelets pollinated in 1952.



Figure 3 W709
Rust resistant WWP No. 24 falling in the
narrow-crowned, fine-branched group.



Figure 4. W668
Rust resistant WWP No. 64 falling in the
wide-crowned, coarse-branched group. It is
in the same locality as No. 59 of Figure 2.



Figure 5. W284-1
Rust resistant WWP No. 22 falling in the
wide-crowned, coarse-branched group. It
is in the same locality as No. 24 of
Figure 3.

rust resistance may vary among selections, and selfed progenies may be required to appraise the heritability of resistance in seedlings from parent trees not possessing similar resistance mechanisms. In eight self-pollinations harvested to date, the seed yield from selfed cones and the performance of selfed seedling progenies are of interest. In either self-pollination or cross-pollination, about 75 percent of the controlled pollinated flowers mature into normal cones. Here the similarity stops for the cones from self-pollinations yield on the average only about half the number of sound seed per cone as do the cones from cross-pollinations (i.e., 42 vs. 80 sound seed per cone). Furthermore, selfed seed may have barriers to germination not found in crossed seed for more than 700 selfed seed representing six different self-pollinations germinated only about 85 percent as completely as did cross-pollinated seed of the same six seed parents (i.e., 71.2 percent vs. 84.0 percent). Lastly, selfed progenies now under observation as 1-0 seedlings in the Spokane resistant tree seed nursery appear far less vigorous than cross-pollinated progenies of the same seed parents.

Thus far, in some 20 self-pollinations attempted there appears to be no phenological barrier to selfing, the periods of maximum flowering and pollination being identical, or of sufficient duration so that the periods overlap for several days. Extreme heterogeneity in the height growth of 1-0 wind-pollinated seedlings from isolated selections compared with relatively uniform height growth in controlled cross-pollinated seedlings from the same trees leads us to the belief the wind-pollinated progenies may include many naturally selfed seedlings. In seed orchards with trees spaced widely to encourage maximum flower and pollen production, it might not be possible to prevent such natural selfing. The low seed yield and slightly lower seed germination following self-pollination may reduce the number of selfed seedlings produced. Roguing of dwarfed seedlings might then be depended upon to remove most of the remaining inbred seedlings.

4. Nursery production of controlled pollinated resistant tree seedlings begun

Seed from the 1950 controlled pollinations among resistant selections, from wind pollination of selections, and from squirrel caches of common western white pine cones were stratified over winter, 1951-52, for planting in the early spring of 1952. The Institute of Forest Genetics stratification method was used.

Seed were planted on April 29 in a small nursery especially prepared for the resistant tree seed at Spokane, Washington. The nursery illustrated in figure 6 is composed of two 90' x 4' hardware cloth-covered beds, the lower bed containing some 150 compartmented flats for progeny test seedlings and the upper bed containing broadcast sown reserve seedlings for transplanting into the lower bed. In figure 6, a seven-man crew: C. A. Wellner, Marvin W. Foiles, and Richard F. Watt of the Inland Empire Research Center, Northern Rocky Mountain Forest and Range Experiment Station, and H. A. Brischle, D. F. Williams, Q. W. Larson, and Bingham of this office, are planting the various seed lots used in the 1952 progeny trials. The individual plant band method of handling seedling progenies in an experimental design later to be employed in field planting (see p. 101, 1951 Annual Report, Northwestern Project) is proving well worth the initial work in building special flats,

filling them with plant bands and forest soil, and planting single seeds according to a complex plan. Figure 7 shows a close-up view of the planting work in progress. Each man was given a single lot of stratified seed, representative of a controlled pollinated cross among resistant trees, plus a small card showing him where the seed were planted. He then planted 9 10-compartment rows randomized among the 891 rows of the 150 flats comprising the progeny testing experiment. After planting the nine rows of plant bands, he planted excess seed in the proper compartment in the broadcast seedbeds above. Seed in plant bands and that broadcast sown were immediately covered with about one-eighth inch moist white sand.

Use of the randomized block design in the seedbeds has increased reliability of measurements for appraising apparent differences in seed germination and seedling height of the various seedling progenies under trial. Height measurements are not yet compiled by the Northern Rocky Mountain Forest and Range Experiment Station, but 100-day germination data are available below.

Germination of Seed Progenies in 1952 Trials

Type of Pollination Seed Parent	Pollen Parent	Number of Lots	Percent Germination
Resistant WWP	Resistant WWP (crosses)	72	84.8
Resistant WNP	Same Resistant WWP (selfs)	6	71.2
Resistant WWP	Wind (1950 seed year)	15	62.8
Resistant WWP	Wind (1951 seed year)	2	75.3
Resistant WWP	Resistant EWP ^{1/}	5	90.2
Resistant EWP	Resistant EWP ^{2/}	8	67.5
Resistant EWP	Wind (1951 seed year)	2	75.1

^{1/}Pollen sent by R. F. Patton, from rust resistant selections made by

^{2/}Dr. A. J. Riker.

^{2/}Seed sent by R. F. Patton, from controlled pollinations among Dr. A. J. Riker selections.

It can be seen that germination in the tarpaper plant bands was satisfactory, following stratification by the Institute of Forest Genetics method (see also figure 8). Transplanting into the plant bands from reserves of seedlings produced in broadcast sown beds was also fairly successful, between 50 and 80 percent of the 1-year-old or younger transplants surviving. Seedlings were transplanted from a few weeks after emergence through October. Roots of the 1-0 seedlings have in some cases already reached the bottom of the 8"-deep plant bands. Probably some root pruning will be necessary before transplanting them as 2-0 seedlings. Top development was good, some 1-0 seedlings reaching 4-5" in height by the end of the first growing season. Production of 5-needle foliage was quite common. Damping-off losses in the acid forest soil of the plant bands were low, averaging 2 to 3 percent.

Some interesting conjectures, based on the relative heights of different progenies, can already be drawn from an examination of the young seedlings. Whether the apparent vigor differences continue to hold remains to be seen.



Figure 6.

W757

View of the Spokane resistant tree seed nursery with seed beds for 1952 progeny trials in place. Seedlings will grow here for 2 years then be outplanted on three progeny test plots.



Figure 7.

W753

Planting resistant tree seed in the special compartmented flats used for seedling production at the Spokane resistant tree seed nursery, April 29, 1952.



Figure 8.

W770

Seedling progenies of several controlled and wind pollinations about $3\frac{1}{2}$ months after seeding. Germination was uniformly good.

(a) The dwarfing of selfed progenies is obvious when selfed seedlings are compared with wind pollinated seedlings or controlled cross pollinated progenies of the same selection. Selfed seedlings are usually shorter in height. Figures 9 and 10 demonstrate this dwarfing effect of selfing. In figure 9, the selfed seedlings of resistant selection No. 58 are compared with ordinary wind pollinated seedlings of the same selection. The 10-seedling rows of the two progenies run left and right across the photograph, with the selfed seedlings in the front row and the wind pollinated seedlings in the rear row. Figure 10 shows the same relationship between selfed seedlings of resistant selection 19 and wind pollinated seedlings of selection 19. Note that in both figures the selfed seedlings are quite uniform in height, but that they are usually shorter and stunted when compared with the average of the wind pollinated seedlings. The wind pollinated seedlings vary greatly in height but average taller than the self pollinated seedlings. Another possible effect of selfing appears to be a reduction in seed germination as already discussed in Section 3, Controlled pollination work. Figure 11 shows germination the self 39 x 39 vs. that in 2 cross pollinations 19 x 16 and 19 x 39. Only 4 of the 10 selfed seed of progeny 39 x 39 have germinated, while the 2 rows of cross pollinated seed display good germination. Self 39 x 39 produced seed of which only 46 percent were germinable, compared with 86 percent germinability in seed of 2 cross pollinations made on selection 39.

(b) Some of the hybrid seed produced using single seed and pollen parents of western and eastern white pine have grown into exceptionally vigorous seedling progenies, others are only moderately vigorous, and still others less vigorous than the average of intraspecific progenies. Figures 12 and 13 demonstrate the range in hybrid vigor obtained in seedlings of a hybrid produced by crossing with pollens of Dr. A. J. Riker's resistant Pinus strobus selections on conelets of our own resistant western white pines. The hybrid seedlings are in the rows tagged 19 x S5 (resistant WWP selection 19 x A. J. Riker resistant EWP selection 5) and 39 x S19 in figure 12 and 19 x S19 in figure 13. Progenies 15 x 30 in figure 12 and 30 x 1 in figure 13 are straight resistant WWP crosses. Note that seedlings of hybrid progeny 39 x S19, rear row figure 12, are extremely vigorous, compared with WWP progeny 15 x 30, but that hybrid progeny 19 x S5 is only moderate in vigor, about equal to the straight WWP progeny 15 x 30. In figure 13, a hybrid progeny 19 x S19 of quite low vigor is compared with the straight WWP cross 30 x 1.

(c) There is a possibility that crossing of certain selections may result in dwarfing in the seedling progeny produced. Figure 14 shows a western white pine progeny 19 x 37 which may show this dwarfing effect. Note the uniformly short height of the seedlings in the 19 x 37 row compared with the relatively vigorous seedlings in the 37 x 17 row. Resistant selection No. 37 is the pollen parent of the dwarfed seedlings in the row in the foreground, and the seed parent of the normal seedlings in the row in the background. This

may indicate that it is selection 19 which carries and transmits the dwarfing factor. Seed weight apparently does not explain the difference in seedling size in this case.

(d) There is a possibility that progenies produced by cross pollination of trees within the same drainage may be less vigorous than progenies produced crossing trees in drainages as close as 15 miles apart. If different strains of white pine could be built up in areas this close together, then there might be a heterosis effect from crossing among the strains.

The above conjectures remain unproven until tabulation and analysis of seedling height data are completed.

5. Seed from 1951 controlled pollinations collected

Out of 22 intraspecific and 11 interspecific pollinations attempted by the pollination team J. W. Duffield, Squillace, and Bingham in 1951, 25 pollinations resulted in production of enough seed for a second progeny trial beginning in the spring of 1953. Wind pollinated seed of selections and common seed lots will be included to make 39 seed progenies under test in the second or 1953 trial. A three randomized block design similar to that in use for our 1952 progeny trials will be employed. Seed allocations to the Northern Rocky Mountain Forest and Range Experiment Station (19 seed lots), to the California Forest and Range Experiment Station (10 lots), and to Dr. A. J. Riker (5 lots) have already been made.

6. Artificial inoculation of 1-0 nursery seedlings being investigated

The Division of Forest Pathology through its San Francisco office initiated tests on the rust exposure phases of the project this year. Pilot-scale inoculations were performed by Dr. J. W. Kimmey with the assistance of a seasonal employee, P. Clampitt, in late September and early October on controlled pollinated seedlings in the Spokane nursery, and on ordinary 1-0 western white pine seedlings at Missoula and Haugan, Montana. It is hoped that the young 1-0 seedlings can be successfully inoculated on primary foliage and that exposure of the 1-0, then 2-0 seedlings in the Spokane nursery, will hasten results of resistance testing by 2 years. Former plans called for natural inoculation occurring after outplanting resistant tree progenies as 2-0 seedlings.

7. Publications

An article, "Breeding Blister Rust Resistant Western White Pine" by Bingham, Squillace, and Duffield, has been accepted for publication in the Journal of Forestry.

8. Cooperation

Cooperative assignments of the three principal federal agencies (Forest Service; Bureau of Plant Industry, Soils, and Agricultural Engineering; and the Bureau of Entomology and Plant Quarantine) were effectively carried out by



Figure 9. W486
Self and wind pollinated seedlings of rust resistant WWP No. 58. Fourth seedling from the right in the back row is a recent transplant.



Figure 10. W469
Self and wind pollinated seedlings of rust resistant WWP No. 19. The first seedling from the left in the back row is a transplant.



Figure 11. W492
Low germinability of selfed seed in progeny 39x39 vs. high germinability in cross pollinated seed progenies 19x16 and 19x39. Four of 10 selfed seed germinated.



Figure 12. W487
Eastern-western white pine hybrid progeny 39xS19 shows pronounced hybrid vigor, compared with a progeny 19xS5 of the same hybrid and a straight WWP progeny 15x30, both of average vigor.



Figure 13. W478
Eastern-western white pine hybrid progeny 19xS19 of relatively low vigor, compared with straight western white pine progeny 30x1 of relatively high vigor.



Figure 14. W482
Dwarfed seedlings of progeny 19x37 compared with normal seedlings of progeny 37x17. Seedlings in the second and seventh plant bands in the rear row are recent transplants.

the Northern Rocky Mountain Forest and Range Experiment Station (Division of Forest Management Research), the California Forest and Range Experiment Station (Division of Genetics), the Division of Forest Pathology (San Francisco office), and the Northwest and D&I Blister Rust projects. In the conduct of this work, help received from the Forest Service, Northern Region, and from the Bureau of Entomology and Plant Quarantine, St. Joe Blister Rust Control Area, should be acknowledged. The Forest Service provided considerable nursery stock, control seed lots, and nursery equipment for work undertaken this year. They also provided a blister rust laborer to assist in field work. The St. Joe Area provided help in establishing graft and progeny test field plots, some labor assistance, and many facilities for work in pollination, seed extraction, and other jobs.

DEVELOPMENT OF BLISTER RUST ON MAINTENANCE AREAS BEING STUDIED

During postwar years, a large acreage within the control area of the Inland Empire has been placed in maintenance category by the various control operations. It is to be expected that some new rust may develop near the few ribes remaining on maintenance areas or spread into them from adjoining unworked and partially worked areas. The extent of this rust development, at present unknown, will be essential information in determining the need for reappraisal of maintenance work standards. If these standards are ineffective in curtailing rust development, they should be improved and the additional control work needed to protect remaining white pines should be performed. If, on the other hand, present standards are too stringent, they should be relaxed to save on control costs. Because of the lack of information on rust development in maintenance areas and because of the increasing amount of such area, it was agreed that a permanent plot should be established to study amount and type of rust development on a typical maintenance area. An area on the St. Joe operation, near Elk River, Idaho, was chosen for this purpose.

Within a 15 square mile irregularly shaped maintenance area in Squaw, Lindley, and Shattuck Creeks, a centrally located block 3 sections broad and 2 sections deep was selected for establishment of a permanent plot. Beginning in the late fall of 1951, a crew of 11 permanent employees began work slashing and surveying over 15 miles of permanent sample lines in a grid designed to sample white pine reproduction in the 6 square mile plot area. Six sample lines were laid out, three of them 60 chains apart running east and west, and three of them 80 chains apart running north and south. Numbered cedar stakes (stations) were set 5 chains apart along the lines. Location marker stakes were set at road, railroad, trail, and stream crossings.

In the spring of 1952, Bingham with one or two field assistants spent about 3 man-months selecting, locating, tagging, describing, and inspecting permanent sample trees along the six sample lines. One thousand two hundred and forty-five white pines, 5 each at 249 separate stations, comprise the sample. Selected trees were those without trunk cankers and closest to the station (but within $2\frac{1}{2}$ chains of it), and where possible within 1 to 15 feet in height. Where no 1 to 15 foot trees could be found about the station, a whorl of branches on some larger white pine was tagged as a substitute. It proved impractical to attempt to keep the amount of needles (the rust target) of equal size at all stations. Some station areas supported only 1-and 2-foot trees, others only 10-to 15-foot trees, and still others only 40-to 50-foot trees. Thus, without increasing the number of small trees per station, decreasing the number of medium size trees per station, or without tagging portions of whorls or one to several whorls on medium and large trees, the amount of needles on the five trees about a given station could not be equalized. With a total of 1,245 trees to tag and examine, the available time prevented equalization of the amount of needles between stations beyond tagging single whorls in place of entire trees on stations supporting only pole size trees.

Once a tree or whorl of branches was selected for tagging, it was marked with two or more numbered aluminum tags; its bearing and slope distance from station, age, height, diameter, and crown class were then recorded. All recognizable cankers were pruned, and a critical examination was made of the canker age, stage, and year of host wood infected. Canker and all other information were recorded on permanent tree location and description forms (BRC-49). Close examination of cankers found on suppressed branches showed that these cankers were often a year or two delayed in producing first aecia and thus were older than their current stage indicated. Lachmund's system, modified by more recent

findings of the University of Idaho, was used in estimating year in which infection occurred. It is expected that the next inspection of the plot should take place within 2 to 4 years, or else about 2 years following a year very favorable for rust spread.

The grid as established is probably more than adequate for determining new rust development on the area. Beyond this, it is hoped that the positioning of the sample lines in the grid may aid in determining whether new rust is coming from the very low ribes populations within the 6 square mile area, or from the relatively heavy ribes concentrations on nearby areas. Lines progress away from heavy toward light ribes populations in all four cardinal directions. Accordingly, it may be possible to detect rust gradients along the sample lines and to determine whether new infection is coming from within or from outside the maintenance area.

Data on year of infection for the cankers pruned during plot establishment are not yet summarized according to location on the area and the time when that portion of the area entered maintenance status. These data may give some preliminary information on effectiveness of control on maintenance areas.

BLISTER RUST DAMAGE TO MATURE WHITE PINE ON THE CLEARWATER NATIONAL FOREST

It is now common knowledge that serious blister rust damage to mature white pine is occurring on unworked, inaccessible drainages in Inland Empire region (see pp. 91-97, Annual Report, Northwestern Region, 1951). After it was disclosed that young mature stands in the St. Joe National Forest were heavily damaged by blister rust and that revision of existing management plans would be necessary to salvage rust damaged trees, blister rust and timber management personnel on other national forests became aware of the danger to similar stands on their respective forests. The Clearwater National Forest also has extensive areas in young mature white pine stands. Many of these relatively inaccessible over present or proposed road systems have been reserved for cutting in the distant future. The Skull Creek drainage on the Canyon Ranger District was in immediate need of examination since reports of multiple flaggings in the tops of mature trees had been received from various foresters working in the drainage. Accordingly, in July 1952, D. J. Moore, Supervisor, Clearwater National Forester Blister Rust Control Operation, and R. T. Bingham made a preliminary investigation of the mature tree rust damage.

During a 2-day trip, examination of 14 standing and wind-thrown mature white pines along the lower 5 miles of the drainage showed that blister rust damage to this stand of 120- to 140-year-old white pines would be severe. All 14 trees were heavily and generally infected throughout their live crowns, and all had from a few to more than 10 lethal infections (cankers already in, or capable of entering the trunk). From this small sample it appeared that ultimate damage would be equal or exceed that in the St. Joe National Forest stands (60 to 80 percent), but that the time of top-flagging of the mature trees would be about 5 to 10 years delayed (i.e., occurring in about 25-30 years on the Clearwater trees). As a result of this preliminary survey, Mr. Moore proposed a more detailed survey of mature trees be started immediately. Unfortunately, funds for the survey were not available in 1952, but it is hoped that this work can be undertaken in 1953.

PHOTOGRAPHIC AND EDUCATIONAL WORK, 1952

By

Frank O. Walters, Assistant Project Leader
H. Miller Cowling, Photographer

Photographic

The photographic section continued to serve all departments of this office, reproducing maps, charts, tables, and photographs as needed. Field photographs were taken in all areas during the active season. One field trip was taken to the Still Creek plantation area south of Mount Hood, Oregon, to secure pictures of the excessive damage to western white pine unprotected from blister rust in that region.

Educational

The blister rust control exhibit was again shown at the Spokane Sportsmen's Fair. The blister rust control exhibit was strategically located near one entrance of the exhibit tent where everyone entering could easily view the display.

In the spring of 1952, the Northern Rocky Mountain Section of the Society of American Foresters presented an exhibit of forest protection equipment at Missoula, Montana. All types of equipment were shown by forest protection agencies and manufacturers of protection equipment. Although fire equipment predominated, the forest insect and blister rust control exhibits attracted considerable attention. In the blister rust control display, special emphasis was given to spraying equipment highlighting the new lightweight portable power unit and hose attachments. Besides the members of the Society of American Foresters, about 500 Missoula citizens saw the display.

Colored 35 mm. slides were used to illustrate talks given to three service clubs in the vicinity of Spokane. Similar slides were used to illustrate talks given to a number of isolated blister rust camps. Colored slides were used effectively in training the National Park blister rust control crews.

A copy of the film "Blister Rust Enemy of Pine," on loan to the local school film library, has had wide use in the Spokane schools. In the last school year, it was shown to 950 high school students.

The film "A Destructive Invader" was widely shown. A specially equipped pickup truck with a generator permits film showings in all blister rust camps and other remote stations. One of the camp superintendents who resides in North Carolina requested the film for showings before 72 people at Chapel Hill, North Carolina, and Hartsville, South Carolina. Altogether blister rust films were shown 51 times before 2,517 people.

During the year 3,600 pieces of literature were distributed.

PHOTOGRAPHIC, BLACKLINE, MULTILITH, AND MIMEOGRAPH WORK

<u>Item</u>	<u>PACIFIC</u>	<u>NORTHWEST-ERN PROJECT</u>	<u>COAST PROJECT</u>	<u>OTHER AGENCIES</u>	<u>TOTAL</u>
<u>PHOTOGRAPHIC</u>					
Lantern slides, natural color, 3x4 $\frac{1}{2}$	48				48
Lantern slides, natural color, 2x2	176		36		212
Films developed, field films	148		14		162
Copies, 5x7	9			10	19
8x10	276		39	196	511
Printings, 5x7	803		150		953
8x10	56			63	119
9x11	2,397		52	150	2,589
film positives, 8x10	25			2	27
Enlarging, 5x7			18		18
8x10			12		12
16x20			24		24
film positives, 5x7	4				4
Total Items	<u>3,932</u>	<u>345</u>	<u>421</u>	<u>4,698</u>	
<u>BLACKLINE</u>					
Total Maps Printed	1,574			241	1,815
<u>MULTILITH</u>					
Duplimats	103				103
Plates	165		39		204
Sheets printed	70,566		15,000		85,566
Total Multolith Items	<u>70,834</u>	<u>15,039</u>			<u>85,873</u>
<u>MIMEOGRAPH</u>					
Stencils	110				110
Sheets printed	6,000				6,000
TOTAL All Items	<u>82,450</u>	<u>15,484</u>	<u>662</u>	<u>98,596</u>	

ORGANIZATION OF THE NORTHWESTERN PROJECT - 1952

1. Project Leader in Charge, H. E. Swanson
2. Assistant Project Leader, F. O. Walters
3. Cooperative Local Control:
 - a. Clearwater Area, Idaho:
Area Leader, M. C. Riley
Assistant Area Leader, D. F. Williams
Checker Foreman, J. P. Bushfield (Appt. eff. 4/28/52)
Camp Superintendent, William Holland (Fur. eff. 11/10/52)
 - b. St. Joe Area, Idaho:
Area Leader, H. J. Hartman
Assistant Area Leader, W. F. Painter
Control Aid, R. E. Myers
Automotive Mechanic, L. C. Miller
Camp Superintendent, A. E. Turner (Fur. eff. 10/25/52)
 - c. Coeur d'Alene Area, Idaho:
Area Leader, F. J. Heinrich
 - d. Kaniksu Area, Idaho-Washington:
Area Leader, H. A. Brischle
Control Aid, J. C. Gonyou
Checker Foreman, Quentin W. Larson
 - e. Montana Area:
Area Leader, H. J. Faulkner
 - f. National Parks, Washington-Montana-Wyoming-Colorado:
Area Leader, J. C. Gynn
District Leader, C. M. Chapman
4. Education and Information:
H. Miller Cowling, Photographer
5. Office and Warehouse:
L. E. Klatt, Administrative Assistant
E. K. LaPrey, Storekeeper
M. P. Kirsten, Secretary (Steno.)
A. B. Treffry, Secretary (Steno.)
J. L. Radkey, Clerk-Typist

Developmental and Improvement (Project Leader, H. R. Offord, Berkeley, Calif.)
V. D. Moss, Forest Ecologist
R. T. Bingham, Pathologist
J. F. Breakey, Pathologist

APPROPRIATIONS
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
NORTHWESTERN PROJECT, BLISTER RUST CONTROL

Regular Appropriations

Fiscal Year 1952:

Project W-a.W NW (Administrative)	\$129,499.90
Project W-e.W NW (Cooperative)	<u>108,809.47</u>
	\$238,309.37

Fiscal Year 1953 (as of 12/31/52):

Project W-a.W (Administrative)	\$126,300.00
Project W-e.W (Cooperative)	<u>103,000.00</u>
	\$229,300.00

Contributed Funds (Deposited with U. S. Treasury)

State of Idaho	\$30,000.00
Clearwater Timber Protective Association	\$8,784.07
Potlatch Timber Protective Association	6,835.55
Priest Lake Timber Protective Association	<u>4,191.30</u> <u>19,810.92</u>
	\$ 49,810.92



FEDERAL EXPENDITURES, NORTHWESTERN PROJECT, BLISTER RUST CONTROL
CALENDAR YEAR 1952, REGULAR APPROPRIATIONS

	Area	Salaries	Expense	Total
<u>January 1 to June 30, 1952</u>				
I	Planning, Coordination, Technical Direction			
1.1 - Clearwater Area, Idaho	\$ 6,269.49	\$ 545.84	\$ 6,815.33	
1.2 - St. Joe Area, Idaho	7,680.29	2,512.78	10,193.07	
1.3 - Kaniksu Area, Idaho	6,818.35	1,858.72	8,677.07	
1.4 - Coeur d'Alene Area, Idaho	3,104.44	58.49	3,162.93	
1.5 - Cabinet Area, Montana	1,519.51	104.59	1,624.10	
1.5 - Kootenai Area, Montana	1,519.52	104.59	1,624.11	
1.6 - National Parks Area	5,648.08	418.12	6,066.20	
Supervision, Office, Warehouse, Investigations, and Education	26,527.47	4,148.40	30,675.87	
<u>Total, Project I, Jan. 1-June 30, 1952</u>	<u>\$ 59,087.15</u>	<u>\$ 9,751.53</u>	<u>\$ 68,838.68</u>	
III	Cooperative Ribes Eradication on State and Private Lands			
3.1 - Clearwater Area, Idaho	\$ 10,880.15	\$ 7,571.06	\$ 18,451.21	
3.2 - St. Joe Area, Idaho	8,351.96	10,442.44	18,794.40	
3.3 - Kaniksu Area, Idaho	596.91	3,474.26	4,071.17	
<u>Total, Project III, Jan. 1-June 30, 1952</u>	<u>\$ 19,829.02</u>	<u>\$ 21,487.76</u>	<u>\$ 41,316.78</u>	
<u>July 1 to December 31, 1952</u>				
I	1.1 - Clearwater Area, Idaho	\$ 5,889.42	\$ 436.52	\$ 6,325.94
1.2 - St. Joe Area, Idaho	9,380.36	852.36	10,232.72	
1.3 - Kaniksu Area, Idaho	8,146.14	413.14	8,559.28	
1.4 - Coeur d'Alene Area, Idaho	3,104.50	143.83	3,248.33	
1.5 - Cabinet Area, Montana	1,605.93	157.33	1,763.26	
1.5 - Kootenai Area, Montana	1,605.93	157.33	1,763.26	
1.6 - National Parks Area	5,694.35	1,173.89	6,868.24	
Supervision, Office, Warehouse, Investigations, and Education	23,777.31	6,614.79	30,392.10	
<u>Total, Project I, July 1-Dec. 31, 1952</u>	<u>\$ 59,203.94</u>	<u>\$ 9,949.19</u>	<u>\$ 69,153.13</u>	
III	3.1 - Clearwater Area, Idaho	\$ 20,702.82	\$ 10,293.58	\$ 30,996.40
3.2 - St. Joe Area, Idaho	21,547.33	8,020.93	29,568.26	
3.3 - Kaniksu Area, Idaho	13,476.56	3,672.88	17,149.44	
<u>Total, Project III, July 1-Dec. 31, 1952</u>	<u>\$ 55,726.71</u>	<u>\$ 21,987.39</u>	<u>\$ 77,714.10</u>	
<u>Grand Total, Calendar Year 1952</u>				
	\$193,846.82	\$63,175.87	\$257,022.69	





Revised 1957



Blister Rust Control in California and Oregon

ANNUAL REPORT PACIFIC COAST PROJECT 1952

Thomas H. Harris
PROJECT LEADER

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
OAKLAND, CALIFORNIA



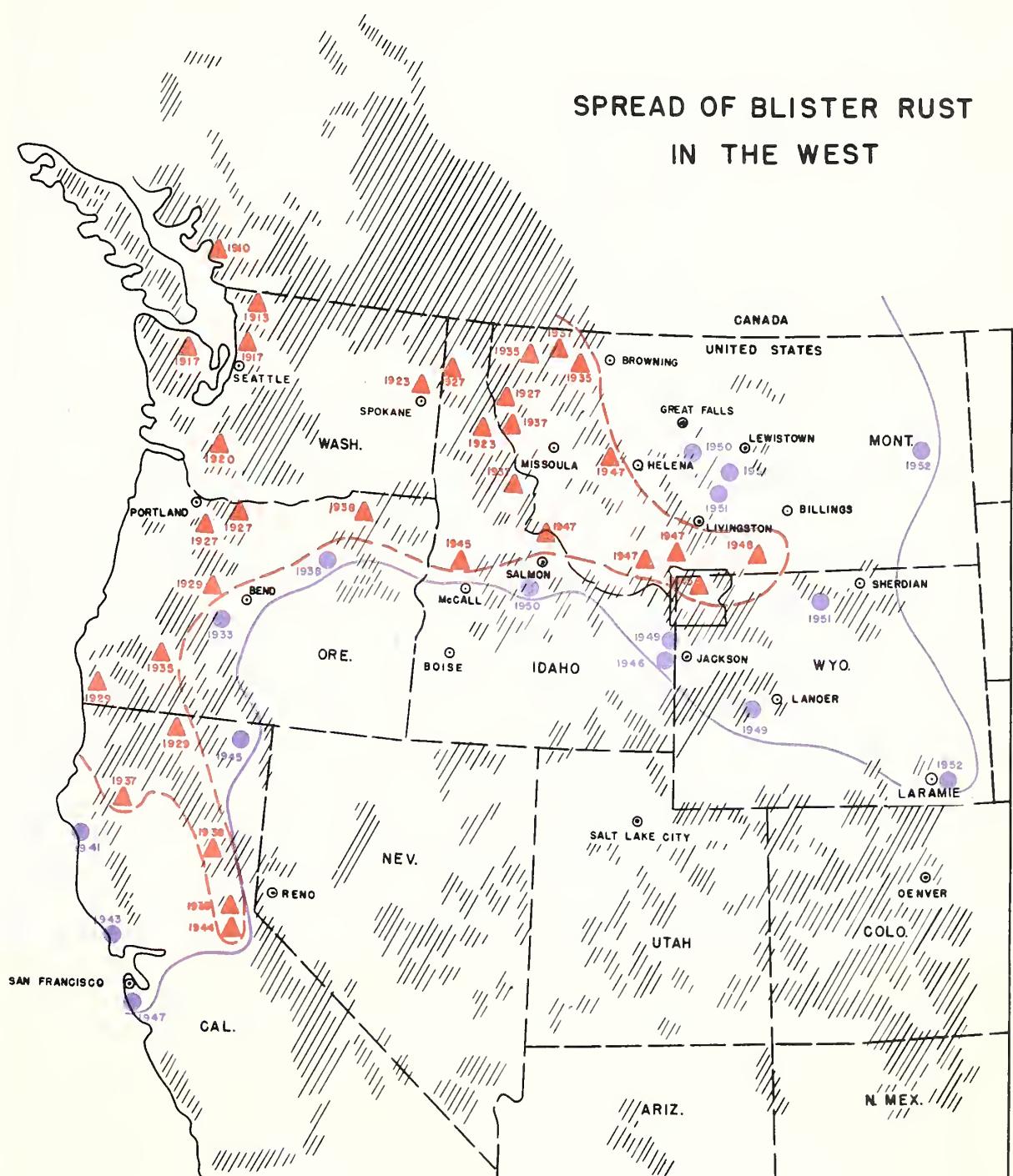


ANNUAL REPORT
ON
THE CONTROL OF WHITE PINE BLISTER RUST
IN
CALIFORNIA AND OREGON
FOR THE
CALENDAR YEAR 1952

HIGHLIGHTS OF 1952 By T. H. Harris, Project Leader
PROGRAM REPORTS By Benton Howard, Area Leader

United States Department of Agriculture
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine
Pacific Coast Project
1515 Clay Street, Sixth Floor
Oakland 12, California
January 1953

SPREAD OF BLISTER RUST IN THE WEST



LEGEND

- ▲ (1910) PINE INFECTION AND YEAR OF ORIGIN
- BOUNDARY OF INFECTION ON RIBES
- (1952) RIBES INFECTION AND YEAR FOUND
- BOUNDARY OF INFECTION ON PINE
- ////// WHITE PINE
- STATE LINES



Aerial photographs, similar to this one, are used extensively in the selection of sugar pine stands for control work. The areas are photographed from an altitude of 20,000 feet with special cameras. On these pictures, when viewed stereoptically, it is possible to map the timber types, ages, densities and topographic features.

LEGEND

Overstory

- S - sugar pine
- D - Douglas fir
- W - white fir

Understory

- Ld - Lithocarpus densiflora
- Ld-5 - Lithocarpus densiflora
of 0.5 density

Markings

- Burn '43 - burned over in 1943
- 100% - 100% kill of the vegetation



section corner and section lines



C O N T E N T S

CONTROL PROGRAM

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White pine blister rust is a forest tree disease caused by a fungus (Cronartium ribicola, Fischer) introduced into North America from Europe about 1900. The disease is widespread throughout Oregon and northern California, where it is severely damaging and killing native white pines. The continued production of white pine timber without control of blister rust is not possible. The problem, then, is the protection of commercial and recreational stands of white pine, a task accomplished through the destruction of the carrier host plants, currants and gooseberries (called ribes), growing in the stands.

The immediate objectives of the control program are (1) to protect selected stands from imminent rust damage through destruction of endangering ribes populations, and (2) to achieve ribes suppression in stands where blister rust is not yet present through the proper ecologic timing of the ribes removal jobs. The ultimate objective is to secure the production of crops of white pine and to protect recreational stands through the permanent suppression of ribes.

Sugar pine, most important commercially of the white pines in Oregon and California, is the largest of all the world's pines. Twenty-two and one-half billion board feet of sugar pine timber now stand in the forests of these two states. A conservative market value for sugar pine stumpage is now about \$25 per thousand board feet. Sugar pine standing timber is therefore worth about \$573,000,000. In addition to this, existing immature growth will produce at maturity an estimated 13 billion board feet worth \$324,000,000.

SUGAR PINE MOST VALUABLE
OF THE WHITE PINES

Sugar pine produces a superior wood prized for its ease of working, straight grain, and shape-holding qualities. Used for foundry patterns, mill work, mouldings, carvings, and exterior work, it is a premium, specialty-use wood. In the white pine markets of the nation the species fills a recognized economic need.

The Bureau of Entomology and Plant Quarantine in 1952 cooperated with the following Federal land-managing agencies by furnishing leadership, coordination, and technical direction to their control projects:

COOPERATION MARSHALS FORCES
TOWARD PROGRAM GOALS

National Park Service, Region 4 (California and Oregon)
Bureau of Land Management (U. S. Dept. of the Interior) (Oregon)
Forest Service, Region 5 (California)
Forest Service, Region 6 (Oregon)

The Bureau furnished technical advice to the Bureau of Indian Affairs in both Oregon and California, and administered the control work of the Forest Service in California.

The protection of private and state lands in California is a cooperative undertaking of the State of California, private timberland

owners, and the Federal Government. California contributed substantially to the Project through an appropriation of \$168,000 for fiscal year 1953, through contributed labor, and through indirect means. The Michigan-California Lumber Company allotted \$2,000 and the Stockton Box Company \$200.

The Project staff is working toward increasing the coordination of blister rust control work with sugar pine management on private and public lands. This has been a major activity of the last several years, accelerated by the sugar pine economic study and the pine delineation work. Cooperation with private timberland owners is constantly increasing in this field.

ONE MILLION ACRES PROBABLE
SIZE OF CONTROL AREA

Beginning in 1949 the application of local control* and of economic criteria to the selection of sugar pine stands has brought about a reappraisal of control areas. This work, effected through the pine delineation project, is now about 85% finished. When completed, control areas in the two states will total roughly 1,000,000 acres, divided between 824,000 acres in commercial stands and 176,000 acres in the national parks. Seventy-six per cent of the total, it is estimated, has received initial ribes eradication, 44% second and other treatments, and 24% is on maintenance.

At the present rate of progress initial work will be completed in from 8 to 10 years. About 58% of the control area is cut over. The suppression of ribes on presently cut-over lands will require from 15 to 20 years; these lands should then be in a state of maintenance until they are further disturbed. The uncut mature timber, forming 42% of the control area, is being logged currently and will be completely logged probably in the next 20 to 30 years. Logging, through soil disturbance, sets off a vigorous cycle of ribes regeneration. Suppression of the new host plant population is undertaken immediately on freshly logged areas and requires a series of eradication extending through 10 to 15 years. Ribes removal jobs, using minimum figures, will be needed on parts of the now unlogged control area throughout the next 30 years. When reserve stands are logged from old cut-over lands at future times, ribes regeneration will be set off that must again be suppressed. The size of the annual eradication job will gradually decrease in this period as ribes suppression is reached on a larger and larger acreage until at the end of the period most of the control area will be on maintenance. After control of the disease has been established, maintenance work will be required indefinitely at a small annual charge per acre. It will consist in the removal of ribes plants regenerating in small areas of permanent ribes sites and of occasional regenerating plants.

*Local control may be defined as the restriction of ribes eradication to the immediate pine stand itself and to a relatively narrow protective zone. It is applied in California south of the Shasta National Forest.

It cannot be said that a disease control program such as the control of blister rust will be completed at a definite time or in a stated number of years. As long as the disease is a threat, host plants must be destroyed and a sanitary condition in the stand maintained. After the initial destruction of host populations this will always require vigilance and some control work.

Ribes were destroyed on 61,000 acres in the 1952 season, 56% of the work being performed by contractors. Ribes surveys showed that an additional 53,000 acres did not need eradication treatment at this time. The total area treated increased from 86,000 acres in 1951 to 114,000 acres in 1952, an increase of 28,000 acres.

CONTRACT WORK PARAMOUNT IN
1952

Sugar pine delineation surveys by the Bureau of Land Management, the Forest Service, and the Bureau of Entomology covered 256,000 acres. Economic criteria were applied in the selection of management units, and the concept of local control was used in outlining control unit boundaries. Professor H. J. Vaux is preparing for publication a manuscript on the results of the sugar pine economic study.

The pine delineation work mentioned above is resulting in a reappraisal of control areas. In general only those sugar pine stands in which the value of the product at harvest will equal or exceed the cost of production are being considered for rust protection. Accompanying this is a rapidly increasing stress on sugar pine management. Joint action has been taken with land owners in the initial selection of stands and in discussions of management policy. On private lands that have not yet received control treatment no control work is undertaken unless, first, the stands meet the economic criteria, and secondly, a management policy aimed at retaining sugar pine in the stand has been adopted by the owner. Thus far the Bureau of Entomology and Plant Quarantine has collaborated with some 18 large lumber companies and timber owners, with most of whom satisfactory arrangements have been made with regard to sugar pine management practices. These steps are an attempt to fit the application of blister rust control into the larger framework of sugar pine management, of which it is a vital part.

CORRELATION OF SUGAR PINE
MANAGEMENT AND BLISTER RUST
CONTROL RECEIVES IMPETUS

The Bureau of Land Management (U. S. Department of Interior) and the Forest Service have embarked on active sugar pine management programs for the lands under their control.

Three major trends in control work are resulting in reduced costs. These are (1) local control, (2) application of economic criteria to the selection of white pine stands, and (3) the practice of contracting ribes eradication. The first two have eliminated non-productive white pine areas and have insured the expenditure of control funds where the highest return will be achieved. Work under the contract procedure has proved to be from 20% to 30% cheaper than that done with hired labor.

IMPROVED CONTROL METHODS
REFLECT LOWER COSTS

These savings have spelled cheaper costs, and have been the prime cause in reducing the Forest Service allotment for Region 5 from \$425,000 in fiscal year 1952 to \$360,000 in fiscal year 1953.

RUST INFECTIONS INTENSIFYING OUTSIDE OF CONTROL AREAS

areas. It is firmly entrenched in the northern part of California--the Siskiyou-Klamath-Trinity country--where damage to young sugar pine is extensive. In the northern Sierra Nevada rust is established at many scattered stations and is intensifying. Its southernmost location on sugar pine is in Calaveras County east of Jackson.

STUDIES IN RIBES ECOLOGY AND RUST BEHAVIOR BENEFIT PROJECT

summarized by Forest Ecologist Clarence R. Quick of the Bureau's Development and Improvement Project in Bureau Ms. 9819, "Ecology and Control of the Sierra Nevada Gooseberry." Material for this paper was gathered through field studies extending over the last 25 years. Ecologic knowledge, through effectively guiding the direction of ribes suppression and helping set control standards, has contributed to effective performance of the job.

Studies in behavior of the disease, particularly in distance of spread and in ribes live stem tolerance, are now under way in southern Oregon under direction of D. R. Miller, pathologist, of the Development and Improvement Project. When these studies are completed, valuable information on rust behavior will be available. Experiments in spraying ribes populations from aircraft were conducted in California in cooperation with the Bureau's Special Equipment Research Center of Oklahoma City. Full summaries of these activities will be found in the Development and Improvement Project's report beginning on page 33.

RECOMMENDATIONS

1. Increase coordination of blister rust control with other white pine management measures on lands of all ownerships.
2. More facts are needed on rust behavior under climatic conditions in California and southern Oregon, specifically on amounts of ribes live stem causing damage under different conditions and distance of rust spread from ribes. Answers to these questions will determine such vital policies as control standards and width of protective zones, policies that are now not wholly based on verifiable facts.
3. Public agencies responsible for forest management should accelerate research on the silviculture of sugar pine. Knowledge of how to

regenerate sugar pine after logging and how to manage the stand successfully for maximum growth is lagging seriously.

To give a stronger legal base for handling control of forest diseases in general, California is proposing a revision of its forest insect law to include the field of forest diseases. If adopted, this change will give the state forester full statutory authority to control forest diseases.

PROPOSED CHANGE IN
CALIFORNIA LAW

TABLE I
SUMMARY OF RIBES ERADICATION BY AGENCY - 1952
PACIFIC COAST PROJECT - OREGON AND CALIFORNIA

Operating Agency	Worked Area		Inspected And Requiring No Work	Total Acres Covered	Thousands of Ribes Destroyed	Total Man Days	Per Worked Acre	
	Initial Erad.	Reerad.					Ribes	Man Days
Forest Service, R-6 (U.S.D.A.)	597	4,046	1,847	6,490	49	1,180	11	0.25
Forest Service, R-5 (U.S.D.A.)	7,783	5,710	11,941	25,434	1,706	7,819	126	0.58
National Park Service (U.S.D.I.)	5,605	8,351	15,571	29,527	2,532	13,758	181	0.99
Bureau of Land Management (U.S.D.I.)	1,410	7,946	6,681	16,037	49	1,584	52	0.17
Eq-State of California	6,515	13,204	17,279	36,998	1,218	8,550	62	0.43
Totals	21,910	39,257	53,319	114,486	5,554	32,891	91	0.54

TABLE II
STATUS OF BLISTER RUST CONTROL BY LAND OWNERSHIP,
PACIFIC COAST PROJECT
AS OF DECEMBER 31, 1952

Land Ownership	Acres in Control Area	First Working Acres	Second Working Acres	Other Workings Acres	On Maintenance		Remaining Work Requiring Rework Acres	
					Acres	Per Cent	Acres	Per Cent
California:								
National Forest	572,300	369,966	65	184,491	138,108	58,585	10	202,334
National Park	165,726	130,793	80	96,749	58,239	91,556	55	34,933
State and Private	601,256	375,683	62	179,279	128,861	52,772	9	225,573
Oregon:								322,911
National Forest	96,032	87,349	91	49,083	37,328	21,897	23	8,683
National Park	3,782	3,632	96	1,115	416	3,371	89	150
Bureau of Land Management	52,950	47,282	89	31,425	5,659	18,848	36	5,668
State and Private	16,276	15,059	93	7,741	4,155	2,564	16	1,217
Totals	1,508,322	1,029,764	68	549,913	372,766	249,593	17	478,558
								780,171

The Pacific Coast Project for the control of white pine blister rust is a cooperative one amongst four federal agencies, two states and two lumber companies. Each federal agency conducts the control efforts on lands under its jurisdiction, while the states and private companies contribute funds or facilities.

In the Lea Act of 1940 the Congress delegated to the Bureau of Entomology and Plant Quarantine the responsibility for the leadership, coordination, and technical direction of the entire program. In addition this Bureau is charged with the overall collection, summary, and presentation of statistical control data. In line with these responsibilities it is necessary to work closely with representatives of the several participating agencies. Frequent conferences and discussions are held, and continual contacts particularly during the field season are maintained with them to facilitate progress.

RESPONSIBILITY DELEGATED
BY CONGRESS TO BUREAU

The Bureau's Project Office at Oakland, California, takes the lead in organizing the control program in the States of California and Oregon. The project leader gives direction and supervision to the project and actively works with the states, the cooperating agencies, and the lumber industry on policies, financing and program planning. Three geographical areas have been established for the administration and conduct of the work. Each of these areas is under the direction of an area leader, who also acts as a staff assistant to the project leader. Area I comprises the work in Oregon and on the Klamath and Shasta National Forests and adjacent lands in California. Area II comprises the work on the Lassen Volcanic National Park, the Lassen, Plumas, Tahoe, Eldorado, and Mendocino National Forests and adjoining areas. Area III includes the Stanislaus, Sierra, and Sequoia National Forests, the Yosemite and Sequoia-Kings Canyon National Parks and adjacent areas. Each area is subdivided into several operations, which are normally a national forest or a Bureau of Land Management district each with adjacent state and private lands or a national park. An operation supervisor is in charge of each operation.

PROJECT OFFICE LEADS
PROGRAM

This staff is responsible for the technical direction of the program, for cost estimates, budgets, work plans, and records. The execution of the work on state and private lands is their responsibility, and under a memorandum of understanding with Region 5, Forest Service, the Bureau has been delegated the responsibility for supervising the ribes eradication work on national forest lands in California.

Educational activities and the recruitment of seasonal workers are under the direction of a staff assistant. Motion pictures on blister rust were shown 40 times to an aggregate audience of 8,700 persons. Approximately 1,000 pieces of literature were distributed. Blister rust control activities were presented over a San Francisco TV station in June. Permanent pictorial exhibits were prepared for four national parks. At the

request of the National Park Service 275 men were recruited for blister rust work in the parks. In addition 132 seasonal workers were secured for the Bureau.

CONTRACTORS DO MOST OF THE WORK

Following the trend started several years ago a steadily increasing percentage of all ribes eradication is now being done under contract. This procedure was started experimentally in 1946 and has now expanded until 56% of all the ribes eradication work was done by contractors during the 1952 season. On several operations all ribes eradication was accomplished in this manner. Specifications for the work have been drawn, and inspection methods and procedures have been devised to insure compliance with the terms of the contracts. The most successful contractors have been individuals working alone or partnerships of two or three persons. In developing this procedure it has been necessary to recruit inexperienced people and to interest them in ribes eradication contracts. Procedures for training and instructing inexperienced contractors in the technique of ribes eradication have been evolved.

LARGE SCALE CHEMICAL WORK NEARING COMPLETION

The use of the chemicals 2,4-D and 2,4,5-T reached its peak in 1952 when ribes on 2,540 acres were sprayed. Future work will be at a reduced rate since the initial spraying of heavy populations of ribes over extensive areas on several operations has now been finished. Nevertheless considerable area will be treated annually for some years on new control units, on freshly logged lands, and on some area where respraying is necessary. The basal stem treatment of individual ribes with 2,4-D and 2,4,5-T will be expanded. Large troublesome bushes and concentrations of limited extent will be handled in this fashion. Light weight portable pumps and tanks were field tested. Satisfactory spray equipment that can be transported by man power is now available for general operational use. With this equipment ribes concentrations close to water that are inaccessible to motorized spray equipment can now be efficiently treated.

PROCEDURES DEVELOPED FOR MAINTENANCE WORK

Areas reach a maintenance condition as a result of ribes eradication and as ecologic stability is approached. In a maintenance condition the pattern of ribes distribution and regeneration is different

from that which existed formerly. The problem becomes one of locating scattered individual plants and small concentrations of ribes. The actual eradication job is negligible. Procedures are being devised to locate and remove these few remaining ribes at a minimum cost. Ribes distribution and regeneration patterns from previous work records are analyzed, and in many instances it is possible to restrict the checking and eradication work to limited parts of an area. In some cases checking can be dispensed with and eradication work confined to a few roads and streams. In the checker-flanker method, two eradicators work with the checker when he post checks an area. They search on each side of the check strip and remove all ribes as encountered. When ribes are so numerous as to slow the checker, all three work out the concentration;

or if it is of considerable size it is flagged for later work by force account or contract. In post checking an area nearing maintenance the checker when working alone digs the occasional bushes and maps in detail any concentrations found in order to keep the eradication work to the minimum. Methods of varying the checking sample in places of likely ribes sites have been devised in order to map in detail any small concentrations that may be present.

On ribes eradication contracts compliance with the contract terms becomes of paramount importance. Inspection of ribes eradication work is termed checking, whereby a systematic sample is taken to determine ribes size, number, and distribution on an area. Following work by a contractor a check is made to determine if contract specifications have been met. Since payment to the contractor is based on the results of this check, it is imperative that all reasonable safeguards be observed to insure its validity. Accordingly, certain policies and procedures have been adopted to secure satisfactory checking. These are:

1. Each checker is adequately trained in all phases of his work before being assigned to contract checking.
2. The work of each checker is thoroughly reviewed about once each week. Some of his check strips are reexamined for adequacy, and work procedures are reviewed with him.
3. Standards of satisfactory performance have been established; checkers that fail to meet them are released.
4. The percentage of sample is variable from a minimum of 5% on large blocks to 10% on small blocks and critical areas.
5. The checking sample is intensified along streams and areas of high rust hazard where rigid suppression of ribes is required.

As a result of these measures, checking accuracy and consistency have increased; and checking data are statistically dependable.

Observations of the technical staff indicate that 1952 was unfavorable for the spread of blister rust in the Sierra Nevada. No infection on sugar pines was found except in areas where rust has been present for several years. A two-man party intensively scouted the northern half of the Stanislaus Forest. No new infection was found, and the Moore Creek center on the Stanislaus (Calaveras County) remains the southernmost known infection on sugar pine.

During the past several years the Bureau has cooperated with the Forest Service, the California Forest and Range Experiment Station, and the University of California in developing economic criteria

INSPECTION PROCEDURES
STRENGTHENED

NO SIGNIFICANT NEW BLISTER
RUST INFECTION

ECONOMIC APPROACH BASIC
IN AREA SELECTION

for the selection of sugar pine stands for protection. This study by Dr. Henry J. Vaux of the School of Forestry, University of California, was completed this year. The study indicates that it is economically feasible to produce approximately 155 million board feet annually for the period 2010-2070 A.D. when sugar pine will be in shortest supply. This will require about 625,000 acres of the best sugar pine land. The advisory committee on the economics of sugar pine management, comprising representatives from the lumber industry, the State of California, the Forest Service, R-5, the California Forest and Range Experiment Station, and this Bureau, met in Sacramento in March to consider the report, which was approved in principle.

By using site, level of management, and size of the sugar pine crop tree, future yield at harvest age can be predicted. The cost of management and of protection from blister rust carried at 2 1/2% interest to harvest was computed. These costs compared with the value of the future yield and discounted to the present furnishes an economic rating. Tables for the several sites and cost levels were prepared that give the present economic value for the individual sugar pine crop tree. By using these tables in rating areas, an economic evaluation is secured, which is the principal factor used in selecting areas for inclusion in the control program. Sound administrative judgment in evaluating all factors is required.

SUGAR PINE STAND EVALUATION STANDARDIZED

Based on the premises established by the Vaux study, the procedures used in evaluating sugar pine stands in California by the Forest Service, R-5, and the Bureau were standardized. The criteria used in

selecting crop trees and survey techniques were established. A manual of instructions for the delineation of sugar pine areas was prepared and issued jointly by the Forest Service, R-5 and the Bureau. A training school in sugar pine crop tree recognition and in the evaluation of cut over and mature stands was held on the Lassen operation. Several demonstration and test strips illustrating the many principles to be considered in selecting sugar pine crop trees were established. During this session and those held in 1951 all the technical staff of the Bureau, representatives of the Division of Forestry, State of California, timber management staff men from Forest Service, R-5, and many seasonal technicians were trained in the use of the criteria and methods. As a result the selection of areas for sugar pine management and blister rust control has reached a high degree of uniformity in California.

APPRAISAL SURVEYS AND STUDIES

During 1952 surveys and studies were made on several national forests, nurseries, experimental forests, and on Indian reservations to appraise the problems of blister rust control in order that the land-managing agency might reach decisions as to management plans and policies.

A preliminary survey of the sugar pine stands on the Mendocino National Forest indicated that some of the better stands appear to be economically sound for continued sugar pine production and management. The Forest Service and the Bureau have agreed to conduct a joint delineation survey in 1953 on the intermingled private and national forest

lands to select stands that qualify for sugar pine management. Sugar pine stands on the Trinity National Forest were examined, and discussions were held with the forest supervisor and staff. Some sugar pine stands on the western part of the Shasta National Forest appear to have some possibilities for management. The Forest Service is appraising the national forest lands and will reach a management decision within a year or so. The Southern Pacific Land Company owns some sugar pine lands with definite management possibilities. Discussions will be held early in 1953 with the Company concerning blister rust control on their lands. Blister rust is generally present throughout the northern Coast Range, and decisions on sugar pine management and blister rust control should be reached in the near future.

Blister rust infection conditions and costs of nursery sanitation were appraised at the Wind River and Bend Nurseries operated by the Forest Service, R-6. Sanitation would not be costly at the Bend Nursery but the feasibility of growing sugar pine stock is questionable. The Wind River Nursery is not at present completely sanitized. Much infection is present on native five-needle pines adjacent to the nursery. The cost of securing and maintaining protection for young five-needed stock will be high. The growing of such stock and its protection from blister rust needs further study.

At the request of the Indian Service, preliminary surveys were made on the Hoopa Reservation in California and the Warm Springs Reservation in Oregon. On the Hoopa Reservation much infection is present within the sugar pine stands. One area of about 2,500 acres of fairly low site is worth some consideration since it is reasonably free of infection and control is feasible. A cost estimate was furnished the Indian Service to aid them in reaching a decision on sugar pine management for this stand.

Blister rust has been present in areas adjoining the Warm Springs Reservation since 1925. Despite this, little rust is present in the western white pine stands. Control appears to be feasible in any stand that it might be desirable to protect from blister rust. Since white pine values are marginal, it was recommended that, if the Indian Service desires to maintain white pines, specific stands be selected and further studies be made of them so that specific recommendations can be made.

Studies were made in conjunction with the Siskiyou-Cascade Research Center concerning the growing of sugar pine in southern Oregon. Preliminary inspections were made of the sugar pine stands in the Port Orford Cedar Experimental Forest to determine the feasibility of blister rust control. A full report is being prepared. On the South Umpqua Experimental Forest sugar pine management is the primary objective. Between 500-600 acres support fully stocked stands of advance reproduction composed of a high proportion of sugar pine dominants. Plot studies indicate that about 60% of these dominants are infected with blister rust. Without ribes eradication and canker removal it is estimated that very few young sugar pines will survive to harvest. With ribes eradication, pruning, and release cutting it is estimated that over 75% of merchantable trees at harvest time could be sugar pine.

WORK ON STATE AND PRIVATE LANDS IN CALIFORNIA

The conduct of the blister rust control program on state and private lands is a function of the Bureau of Entomology and Plant Quarantine. The program is executed in cooperation with the California Division of Forestry of the Department of Natural Resources, and private land owners. The Bureau's staff administers the control work. The State of California and private owners contribute funds or facilities and assist in the long-range planning of the program.

CALIFORNIA LEADS THE NATION IN FINANCING BLISTER RUST CONTROL

California, through appropriations of \$168,000 for each of the 1952 and 1953 fiscal years, provided the major share of the funds for ribes eradication work on state and private lands. In addition, the California Division of Forestry assigned

California Youth Authority wards from the Dew Drop Camp in Amador County to this work. Their efforts are valued at \$8,237 for 1952. These funds exceed New York's annual contribution of about \$158,000 for blister rust control in that state. The Michigan-California Lumber Company continued its support with a contribution of \$2,000, and the Stockton Box Company again contributed \$200. These monies, supplemented by \$130,267 of federal funds, have adequately financed the work.

RIBES ERADICATION

During the year 36,998 acres were covered. Contractors did 87% of this work, 6% was done by hired labor, and 7% by the Dew Drop CYA crew. The California Division

of Forestry's CYA crew was assigned to the project from June 2 until October 10, accomplishing good work on both hand and chemical ribes eradication. Two small (3-4 men) crews were hired on the Lassen operation to supplement the contract work. When ribes concentrations are small or when ribes are so distributed that the area can be worked by the checker-flanker method, it is often more economical to do the work with hired labor than by contract. Often it is not necessary to string or regular check these areas. An adequate supply of contractors was available on most operations. On the Eldorado operation an oversupply resulted in low bid prices. This situation sometimes causes contractors to default to avoid staying with a losing proposition.

A small area of 26 acres in Amador County on the Eldorado operation was covered by a spray crew working from the Dew Drop CYA Camp. A portable power-spray unit was field tested on small areas on the Lassen operation in Tehama County. This was the only top-foliage spray work done this year on state and private lands. Some basal stem treatment of individual ribes with 2,4,5-T was used in conjunction with hand work.

Ribes eradication was continued on the Ponderosa unit in Siskiyou County on the Shasta operation where about one fourth of the 1,800 acres of private land was worked by contractors. Initial work on the remaining acreage should be finished in 1953. No further work is planned on the Shasta until decisions are reached on areas now under consideration for sugar pine management.

All regular checking was finished by the end of the season. Sufficient area on all operations was advance or post checked to allow for

planning the work for 1953. The checkers covered 65,755 acres during 1952. The Bureau operated four small administrative camps to facilitate this work.

Gratifying progress was made in delineating the sugar pine stands on state and private lands. Since 1949, when the economic evaluation of sugar pine stands was commenced, 406,759 acres have been appraised. Approximately 33,000 acres remain to be evaluated. Yearly accomplishments have been:

1949	-	64,800 acres
1950	-	146,744 acres
1951	-	76,200 acres
1952	-	119,015 acres

SUGAR PINE DELINEATION
NEARLY DONE

On most operations areas qualifying for control work have been selected and approximate control boundaries set. At the request of the Southern California Edison Company a pine delineation survey was made of their holdings near Shaver Lake in Fresno County. The field work was completed in 1952 and is presently being analyzed to assist the Company in reaching decisions concerning sugar pine management.

The sugar pine stands in Latour State Forest in Shasta County and in the Mt. Home State Forest in Tulare County will be evaluated in 1953. About 5,000 acres of privately owned land in Glenn and Lake Counties on the Mendocino operation will be appraised in 1953. Control work will be initiated on the areas that qualify. On the other operations lands logged during the last few years will be examined and their status determined. In addition some small scattered areas remain to be evaluated.

With the development of the economic study it became increasingly apparent that to justify the cost of blister rust control on economic grounds it would be necessary to grow high quality sugar pine. Good sugar pine management practices must go hand in hand with blister rust control. Accordingly the Bureau's staff has discussed with timber owners the present status and objectives of blister rust control work on their lands. Many owners have agreed to join with the Bureau in the selection of areas they wish to manage eventually for sugar pine production and on which blister rust control is economically sound. No initial work is now being done without joint selection of the areas with the owner and an expressed desire on his part to retain the land in sugar pine production.

CLOSER COOPERATION WITH
LAND OWNERS

Discussions have been held with the Shasta Forest Products Company, the Fruit Growers Supply Company, the Diamond Match Company, the Soper-Wheeler Company, the Southern Pacific Land Company, the Michigan-California Lumber Company, the Stockton Box Company, the Southern California Edison Company, the Calaveras Timber Company, and the Weyerhaeuser Timber Company. Sugar pine stands that qualify for sugar pine management and blister rust control have been selected and mapped; the data are being analyzed. The status of these stands will be discussed with the

owner and efforts made to reach an agreement with him to keep them in sugar pine production. Determined efforts are being made to encourage the owners to follow management practices to increase stocking and quality.

STATUS OF THE PROJECT

Work on newly logged lands has been stressed during the last decade. Unless the ribes are removed from these lands within 2-4 years after logging, new seed crops are produced and returned to the soil. When this happens the permanent suppression of ribes is greatly prolonged. Control work is presently up to date on the cut-over lands that qualify. About 10% of these lands each year require ribes eradication. Where rust is not yet present work is deferred for several seasons on all newly logged lands to allow the slash to disintegrate and for the initial crop of new ribes to become readily visible. The lands logged 10-15 years ago or longer are now approaching maintenance. Those logged since then will require 10-25 years more to reach this condition. Many units containing mature stands have had a complete initial working or have had ribes removed from the high-rust-hazard zones and are in a reasonably sanitary condition. These stands will probably be logged within the next several decades. The eradication program in future years on mature timbered areas will largely be geared to the progress of logging. Ultimate maintenance and permanent ribes suppression will be reached many years after the last mature stand is harvested.

The adoption of local control has restricted ribes eradication to areas where sugar pine grows; the application of economic criteria to the selection of stands has restricted work to areas producing highest values. These two procedures have drastically reduced the gross area to be treated. Contract ribes eradication, checker-flanker work, and reducing ribes populations to differing degrees of tolerance depending on the local rust hazards have reduced the cost per unit of harvest.

THE 1953 SEASON

The sugar pine stands on the Mendocino operation will be delineated in 1953, and the sugar pine management areas selected will be checked to determine ribes distribution.

A small contract program is anticipated for the Tahoe and Shasta operations. A 12-man camp will be established on the Klamath operation to do maintenance work on the Beaver Creek unit by the checker-flanker method. Larger ribes eradication programs will be conducted on the Lassen, Plumas, Eldorado, Stanislaus, and Sierra operations. Most of the work will be done by contractors. Some force account work will be done on areas of scattered ribes distribution. Primary attention will be given to ribes eradication on recently logged lands. Several small administrative camps will be operated to facilitate handling the checking and contract work.

RECOMMENDATIONS FOR THE FUTURE

The objective of blister rust control work in California is to protect adequately a sugar pine crop produced either for commercial or esthetic use. To do this certain measures should be continued. These are

(1) to reappraise newly logged lands to determine if sufficient sugar pine stocking remains to warrant control costs; (2) to work with nature as much as rust development will permit in suppressing ribes, that is, to properly time ribes eradication to keep ribes growth to the minimum until ecologic stability and permanent ribes suppression are reached; (3) to suppress ribes only to the degree necessary to secure the level of protection desired; (4) to adjust the level of ribes suppression by the several rust hazard zones on an area to achieve adequate protection; (5) to expand and develop maintenance types of working, such as checker-flanker, to secure desired results at minimum cost; and (6) to encourage and assist the land owner to engage in sugar pine management practices designed to increase the stocking and improve the quality of the sugar pine stand, thereby lowering the blister rust cost per unit of harvest.

THE NATIONAL FOREST PROGRAM

The United States Forest Service in Regions 5 and 6 are conducting blister rust control programs in the sugar and white pine stands on national forest lands of California and Oregon. The Forest Service selects areas for white pine management and executes the long-range programming and planning. Under a memorandum of understanding, the Forest Service in Region 5 has delegated to the Bureau of Entomology and Plant Quarantine the responsibility of supervising the ribes eradication work on national forest lands; in Region 6 the Forest Service has retained this responsibility. The Bureau's staff furnishes technical direction and performs the checking work for both regions.

Allotments for blister rust control work made by the Secretary of Agriculture from Congressional appropriations were \$360,000 to Region 5 and \$60,000 to Region 6 for fiscal year 1953. The allotments for fiscal year 1952 were \$425,000 for Region 5 and \$60,000 for Region 6.

FUNDS HAVE BEEN ADEQUATE

All areas on which ribes were regenerating and in need of treatment in 1952 were covered. In addition considerable work was done on further protecting mature stands and on areas approaching maintenance.

PROGRESS OF RIBES ERADICATION SATISFACTORY

Region 6 performed control activities on 6,490 acres, 55% of which was done by contract and 45% by hired labor. The blister rust control program on the Umpqua National Forest became active again in 1952. All control work had been deferred since 1948 pending crystallization of sugar pine management plans. Several management units now have been established and ribes eradication resumed. Ribes were removed by hired labor from 300 acres of these units in 1952. Checker-flanker teams will cover most of the remainder in 1953, and contract areas will be outlined where necessary to complete the work. A 14-man camp was established on the Rogue River National Forest to continue ribes eradication on the Union Creek unit. Crews from this camp sprayed Ribes bracteosum on 231

acres of stream type in the buffer zones adjacent to the management areas. The crews also worked 10 areas planted with five-needed pine and 2 areas where natural western white pine reproduction grows in nearly pure stands. Including the necessary buffer zones this required covering 517 acres. Work on 2,544 acres was handled by contract. These contract areas were subdivided into 10-acre blocks, and all data were kept by blocks in order to facilitate future work. An additional 1,847 acres were inspected and cleaned up by the checkers.

Region 5 did control work on 25,434 acres of sugar pine stands. Contracting accounted for 88% of this work with the rest being done by hired labor. An inmate camp from the Soledad Medium Security Prison was operated at the Whiskey Falls site on the Sierra National Forest from July 1 to October 20. Hand work and chemical spray treatment was done by the inmates. Two large power-spray trucks were used to cover 70 acres in the Browns Creek drainage. This completes the large-scale spray work in the Whiskey Falls unit. On the Plumas National Forest a small spray crew continued with the spraying of ribes concentrations on Hartman Bar Ridge. Ribes on 33 acres were sprayed and on an adjacent 80 acres ribes were hand pulled. On the Stanislaus National Forest a special spray camp was established at Niagara Creek where 190 acres were treated. Ribes eradication was continued on the Shasta National Forest when additional contracts were let in the 2,500 acres of national forest land in the Ponderosa unit. The contractors finished 232 acres this year. The rest of the unit will be done in 1953 by checker-flanker teams. Checker-flanker maintenance-type work was done on the Beaver Creek unit on the Klamath National Forest. All other work in Region 5 was accomplished by contract.

SUGAR PINE DELINEATION
FINISHED ON SOME FORESTS

Excellent progress was made in 1952 toward finishing the sugar pine delineation work.

In Region 5 the initial job has been successfully completed on the Tahoe, Eldorado, and Sequoia National Forests. It is nearly complete on the Plumas, Lassen, Shasta, and Stanislaus National Forests. The cut-over areas on the Sierra National Forest are just about completed, but some extensive mature stands are to be delineated in 1953. The limited sugar pine stands of the Mendocino National Forest will be delineated in 1953. Approximately one-half million acres have been examined by the delineation parties since 1949 when this work was pioneered by the timber management staff of the Eldorado National Forest. The initial delineation work should be finished in 1953. Thereafter a few small areas may require delineation, and newly logged lands within the management areas will need to be reappraised annually.

In Region 6 young pine stands on 13,840 acres on the Rogue River National Forest were evaluated. The work is now half finished and nearly all the cut-over lands have been covered. The Umpqua National Forest has selected some areas for management and is formulating management policies on several others.

In order to produce the maximum of highest quality sugar pine on the selected areas the Forest Service is experimenting with management practices. A number of demonstration and experimental areas have been established on which several methods of managing for maximum sugar pine production will be tested and observed.

SUGAR PINE MANAGEMENT
PRACTICES ARE BEING DEVELOPED

In 1952 Region 6 initiated experimental work on sugar pine management when about 2,300 acres in the South Umpqua Experimental Forest were designated as an experimental management area by the Siskiyou-Cascade Research Center of the Pacific Northwest Forest and Range Experiment Station. Studies are being made and varying practices will be tested. The Rogue River and Umpqua National Forests are developing procedures in clear cutting and restocking local areas to western white pine or sugar pine.

Region 5 has established several sugar pine management demonstration areas. One uneven-aged, mixed-coniferous stand of 90 acres with a good stocking of young sugar pines on the Lassen National Forest has been marked to release as many sugar pine crop trees and potential crop trees as possible. All sugar pine crop trees and potentials were marked with paint and will be observed after logging to determine loss by logging, release, and other factors. Two small areas will be clear cut and seeded to sugar pine. The Plumas National Forest has two small demonstration areas on recently logged lands on which the residual fir was cut to release as many sugar pines as possible.

The Tahoe National Forest made an improvement cut on a small stand of young mature sugar pine. Great attention was paid in marking, fell-ing, and logging to benefit the sugar pine. As a result of these exploratory treatments of the stands, experience in handling second-growth sugar pine will be obtained. The California Forest and Range Experiment Station's study at Strawberry on the Stanislaus National Forest is yielding valuable information concerning the regeneration of sugar pine in the mixed-coniferous stands of the Sierra Nevada. These various steps are bringing about a closer correlation of blister rust control work with sugar pine management.

The ribes eradication work is up to schedule on national forest land. Progress has been adequate on freshly logged areas to prevent the production of new ribes seed crops. The work as needed in the older cut-over stands has been done on schedule, and many of these are now approaching maintenance. In mature stands on most national forests there has been an initial working or the ribes have been removed from the high-rust-hazard zones.

THE STATUS OF THE PROGRAM
ON NATIONAL FOREST LAND

The work in Region 5 is beginning to taper off, as some areas approach maintenance. The Beaver Creek unit on the Klamath National Forest is now nearly on maintenance. Work here will no longer be required yearly. The work needed on the Eldorado and Stanislaus National Forests has decreased perceptibly during the last five years. Many areas are near maintenance. The annual increment of logged lands

determines to a great extent the size of the annual work load. The work load on these two forests will average about the same size as that of 1952 for the next decade. At the present rate of progress it will require four or five years more on the Plumas, Tahoe, and Sierra National Forests to finish the initial work on all sugar pine management areas. The initial work on the Lassen will be completed by about 1955. Work will be started on the Sequoia National Forest in 1953; it will require about five years to complete the initial coverage. The present units on the Shasta National Forest will have the remaining initial work completed in 1953.

In Region 6 ribes are being suppressed to a very low level. This has become necessary because of the generally high rust hazard and continuing infection on sugar pine when even a few ribes remain in the stand.

LONG-RANGE PLANNING

estimated. These are to be revised each year to bring them in line with the year's accomplishment, rust development, and the progress of logging.

THE 1953 WORK PLAN

The detailed planning will have been completed. The highlights of the 1953 plan are:

1. Ribes eradication will be begun on the Sequoia National Forest. This will be done by contract, and heavy ribes concentrations will be delimited for future treatment with chemicals.
2. The maintenance work on the Beaver Creek unit on the Klamath National Forest will be continued.
3. Initial work on the Ponderosa unit on the Shasta National Forest will be finished.
4. A 10-man spray camp will be established on the Plumas National Forest to treat chemically extensive ribes concentrations on Hartman Bar Ridge. Contract work will be done on all other areas needing treatment.
5. The Sierra National Forest will operate a 25-man inmate camp in the vicinity of Shaver Lake. This crew will work part of the season on ribes eradication and part on other work. Other areas will be handled under contract.
6. Large scale contract programs will be executed on the Lassen, Tahoe, Eldorado, and Stanislaus National Forests. Some areas with few ribes will be worked by the checker-flanker method.
7. All remaining sugar pine delineation work is scheduled to be completed.

The National Park Service is conducting blister rust control programs in Crater Lake National Park in Oregon and in Lassen Volcanic, Yosemite and Sequoia-Kings Canyon National Parks in California. The Park Service selects white pine stands for protection and in Yosemite and Sequoia-Kings Canyon National Parks administers the ribes eradication work. In Crater Lake and Lassen Volcanic Parks the Bureau of Entomology and Plant Quarantine has been doing the ribes eradication work on a reimbursement basis. The Bureau gives technical direction to the work and performs checking activities in all the parks.

Ribes eradication proceeded according to schedule; 11,048 acres were covered during the season. Contracts for ribes eradication were awarded on 1,050 acres, of which all but 178 acres were completed during the summer. The work on these acres will be finished in 1953.

YOSEMITE PARK COMPLETES
SCHEDULED WORK

The Park Service operated three camps in 1952. The work at Crane Flat was mainly reeradication including the respraying of ribes concentrations on 90 acres. Some areas with scattered ribes were treated by specially trained laborers working with the checkers. Nearly all the work from the Base Line Camp was initial eradication. The crews from the Smith Meadows pack camp commenced the initial ribes eradication on this area. Heavy concentrations of ribes on 15 acres were treated with hormone-type chemicals by the basal stem method. Control boundaries were set on marginal portions of this unit and advance checks were made on the areas included. All the camp superintendents, foremen, and many of the laborers were experienced in blister rust control work. Twenty Navajo youths from the Sherman Institute were employed at Crane Flat. Their work was satisfactory and the same number will be employed in 1953.

The eradication season was highlighted on July 2 and 3 when the Mt. Whitney blister rust control camp was moved in by airplane. All equipment and supplies were packaged and dropped by parachute to the camp site located at an elevation of 10,500 feet above sea level. The task was successfully carried out at an estimated savings of \$1,300 over moving in by pack animals. Had it been necessary to move the camp in by animals, the opening would have been greatly delayed because of the snow-clogged passes over the crest of the Sierra Nevada. Two other camps, Redwood Mountain and Red Fir, were operated this season.

AIR TRANSPORT USED BY
SEQUOIA-KINGS CANYON

The Sequoia-Kings Canyon Parks had their most productive season when 18,479 acres were treated. All initial work in the Mt. Whitney, Giant Forest, and Redwood Mountain units was completed as a result of this year's work except a small area in the Redwood Mountain unit which is under contract to be finished in 1953. In addition all areas in need of ribes reeradication were covered. All regular checks were made on schedule and sufficient advance and post checks were made to outline the work for next season.

LASSEN AND CRATER LAKE PARKS
ARE NEAR MAINTENANCE

The control units on Lassen and Crater Lake Parks are approaching a maintenance condition. No ribes eradication work was done in them in 1952.

Lassen Park was worked in 1950 and no

work will be needed until 1955 when about 20% of the area will be post checked. The necessary reeradication on those areas where ribes have regenerated will be done in 1956. It is estimated that less than 10% of the units will require any treatment. The entire cost for both years should be less than \$10,000. The last work in Crater Lake Park was done in 1949. The required post check and any eradication work indicated by that check will be done in 1955. About 10% of the unit will need a check and less than 5% should require any treatment. The cost of this work in Crater Lake Park in 1955 should be less than \$1,000. Any work required in these Parks after 1955-1956 will be on limited areas at intervals of 5-6 years or longer. The future costs will be low unless blister rust spread from ribes to white pines exceeds the limits now indicated, and it becomes necessary to extend the buffer zones.

INITIAL WORK IN YOSEMITE AND
SEQUOIA-KINGS CANYON PARKS
NEARING COMPLETION

The initial chemical treatment of ribes with 2,4-D and 2,4,5-T by power-spray equipment on these Parks was finished in 1952. A few areas remain to be treated by the basal stem method or by using small portable spray equipment. All re-

maining initial work on Sequoia-Kings Canyon Parks is scheduled for completion in 1953. The Chagoopa foxtail pine unit of approximately 3,500 acres is due to be worked next season. With the completion of a hold-over contract the initial coverage on Sequoia-Kings Canyon Parks will be finished. After about 1955 the scope of the reeradication work will decrease. Only those areas on which ribes are regenerating vigorously will require attention. Yosemite Park plans to finish all initial work by 1954. All units will have been covered by then and most of the control area will have had several workings. The reeradication work will remain at present levels for another 6-8 years and will then decrease gradually.

THE 1953 PLAN

In Sequoia-Kings Canyon Parks the Chagoopa, high-elevation, foxtail-pine unit will receive its initial working. The work will largely be the spraying of

localized concentrations of Ribes montigenum with 2,4,5-T. Both pack-sack and portable power units will be used. A 15-man camp will be established and will be supplied initially by parachute drops from airplanes. The camp equipment was moved from the Mt. Whitney unit during the fall of 1952 and is cached at the Chagoopa site for use in 1953. A twenty-five-man camp at Red Fir in the Giant Forest unit, and a 50-man camp in the Redwood Mountain unit will continue the reeradication of ribes from areas previously treated.

Three camps are planned for Yosemite for the 1953 season. The Crane Flat Camp will finish the remaining 200 acres of initial work and will then continue reeradication work in that unit. The Base Line Camp and the Smith Meadows pack camp will continue with the initial eradication of ribes from these areas. The use of 2,4,5-T in the basal stem

treatment of ribes concentrations of limited extent will be continued. Areas light in ribes will be worked by trained eradicators as the areas are checked. The work of the Base Line and Smith Meadows Camps will be supplemented by contracting ribes eradication on about 800 acres.

THE BUREAU OF LAND MANAGEMENT PROGRAM

The Bureau of Land Management through its Medford District conducts a blister rust control program on federal lands in southwestern Oregon. About one half of the sugar pine stands given protection in Oregon are included in the program administered by the Medford District.

The Medford District uses an economic approach devised by the Bureau of Land Management in evaluating and selecting sugar pine stands for protection from blister rust. The conduct of the ribes eradication work is under the general supervision and direction of the district forester. Immediate supervision is provided by a program superintendent. The Bureau of Entomology and Plant Quarantine provides technical direction and supervises the checking activities.

The Medford District simplified and streamlined the administration of their ribes eradication program. As a result, production has increased steadily; and excellent cooperation between the two Bureaus has been achieved. During the 1952 season 16,037 acres were covered by contractors and by personnel from one small force-account camp.

SIMPLIFIED ADMINISTRATION AIDS IN SECURING INCREASED PRODUCTION

The small camp, operated jointly by the District and the Bureau of Entomology and Plant Quarantine, was situated on the Rogue River approximately 10 miles west of Grants Pass, Oregon. It was centrally located with respect to the work areas and presented no supply problem. All eradication and checking activities were conducted from here. Portions of the Trappers Cabin, Evans Creek, Quartz Creek, Swede Basin and Selma areas were worked by the camp crews. Checker-flanker teams completed treatment on 7,495 acres. Contractors worked 1,861 acres. The checkers examined an additional 6,681 acres and found that no ribes eradication was needed on them.

The checker-flanker teams are proving effective on areas of low ribes populations and scattered distribution. This method uses specially trained men, who work on each side of the checker as he runs his check strip. Ribes are searched for and eradicated as the checker proceeds. Samples of rust infection intensity are taken; and when cankers of recent origin are discovered, the ribes causing the infection are found and destroyed. A more positive identification is made of areas that can safely be placed on maintenance and eliminated from further ribes eradication work until a disturbance occurs.

CHECKER-FLANKER TEAMS PROVE EFFECTIVE

CONTRACT WORK DECREASES
SLIGHTLY IN 1952

five contracts held over from 1951 for completion. Thirteen of these were successfully finished during 1952, and the remaining four contracts were extended until 1953 for completion. Contract bid prices were satisfactory. No contractor went into default nor were any cancellations required.

BUREAU OF LAND MANAGEMENT
IS REEVALUATING ITS SUGAR
PINE MANAGEMENT AREAS

portions of blister rust control areas that are unsuited to the growing of sugar pine or privately owned land on which management practices are unstable can be deleted in some situations from the present units. The Medford District is now engaged in the reevaluation of the present blister rust control units, and the selection of those portions on which sugar pine production will be economic. The Bureau's operation supervisor examines the sugar pine management areas and outlines any additional protective zones needed.

Evaluation of the Quartz Creek area was finished in 1952, and approximately 40% of the area was deleted from further consideration. Reevaluation and revision of the other control units will be made before their next scheduled coverage.

THE PLAN FOR THE
1953 SEASON

In 1953 the Medford District of the Bureau of Land Management will again operate the camp near Grants Pass. It will be used as a base from which to administer the season's work. The use of the checker-flanker teams will be continued. Areas not suitable for coverage by this method will be worked under contract. The remaining work on the Selma, Pickett Creek, and Evans Creek areas will be completed. The work on those portions of the Flat Top area that need treatment was awarded to contractors late in 1952 for completion in 1953. The systematic review and revision of the control areas will be continued.

TABLE 1

THE STATUS OF RIBES ERADICATION IN THE PACIFIC COAST PROJECT AS OF DECEMBER 31, 1952

PART A - CALIFORNIA

Control Operation	Class of Ownership	Control Units		Status of Ribes Eradication					Acres on Maintenance	
		Total Acres	Acres Unworked	Net Acres by Workings						
				First	Second	Other	Total			
National Forests										
Mendocino	Federal	8,720	8,720							
	Private	4,080	4,080							
	Totals	12,800	12,800							
Klamath	Federal	3,956		3,956	3,353	2,234	9,543	117		
	Private	7,371		7,371	6,726	4,548	18,645			
	State	45		45	45	90	90	347		
	Totals	11,372		11,372	10,124	6,782	28,278	464		
Shasta	Federal	3,440	1,452	1,988	380		2,368			
	Private	25,400	24,965	435			435			
	Totals	28,840	26,417	2,423	380		2,803			
Lassen	Federal	42,040	20,845	21,195	9,396	4,639	35,230	4,307		
	Private	211,093	105,180	105,913	37,541	32,500	175,954			
	State	582	495	87	40	20	147	23,308		
	Totals	253,715	126,520	127,195	46,977	37,159	211,331	27,615		
Plumas	Federal	139,359	42,912	96,447	46,775	36,831	180,053	24,756		
	Private	72,616	18,438	54,178	26,389	21,574	102,141			
	State	360	285	75	40		115	10,657		
	Totals	212,335	61,635	150,700	73,204	58,405	282,309	35,413		
Tahoe	Federal	16,480	8,532	7,948			7,948			
	Private	2,520	2,401	119			119			
	Totals	19,000	10,933	8,067			8,067			
Eldorado	Federal	107,054	26,877	80,177	35,985	13,051	129,213	10,517		
	Private	110,136	17,399	92,737	52,332	28,351	173,420			
	State	2,292		2,292	1,165	1,141	4,598	9,623		
	Totals	219,482	44,276	175,206	89,482	42,543	307,231	20,140		
Stanislaus	Federal	104,370	7,746	96,624	59,412	52,066	208,102	18,888		
	Private	95,431	5,092	90,339	46,734	31,664	168,737	6,018		
	Totals	199,801	12,838	186,963	106,146	83,730	376,839	24,906		
Sierra	Federal	132,431	70,800	61,631	29,190	29,287	120,108			
	Private	45,602	26,236	17,366	7,037	7,284	31,687			
	Totals	176,033	97,036	78,997	36,227	36,571	151,795			
Sequoia	Federal	14,450	14,450							
	Private	17,150	17,150							
	State	3,400	3,400							
	Totals	35,000	35,000							
TOTAL ALL NATIONAL FORESTS	Federal	572,300	202,334	369,966	184,491	138,108	692,565	58,585		
	Private	589,399	220,941	368,458	176,759	125,921	671,138			
	State	6,679	4,180	2,499	1,290	1,161	4,950	49,953		
	Totals	1,168,378	427,455	740,923	362,540	265,190	1,368,653	108,538		
National Parks										
Lassen Volcanic	Federal	17,779		17,779	17,565	5,389	40,733	15,186		
Yosemite	Federal	101,506	31,161	70,345	55,898	36,160	162,403	53,122		
Sequoia-Kings Canyon	Federal	46,441	3,772	42,669	23,286	16,690	82,645	23,248		
TOTAL ALL NATIONAL PARKS	Federal	165,726	34,933	130,793	96,749	58,239	285,781	91,556		
State Forests and Parks										
Latour Forest	Private	1,344		1,344			1,344			
	State	1,894	380	1,514			1,514			
	Totals	3,238	380	2,858			2,858	1,460		
Calaveras Big Trees Park	Private	120		120	120	120	360			
	State	1,820	72	1,748	1,110	1,659	4,517			
	Totals	1,940	72	1,868	1,230	1,779	4,877	1,359		
TOTAL ALL STATE FORESTS AND PARKS	Private	1,464		1,464	120	120	1,704			
	State	3,714	452	3,262	1,110	1,659	6,031			
	Totals	5,178	452	4,726	1,230	1,779	7,735	2,819		
Totals for California										
TOTAL ALL CONTROL OPERATIONS CALIFORNIA	National Forest	572,300	202,334	369,966	184,491	138,108	692,565	58,585		
	National Park	165,726	34,933	130,793	96,749	58,239	285,781	91,556		
	Totals	738,026	237,267	500,759	281,240	196,347	978,346	150,141		
	Private	590,863	220,941	369,922	176,879	126,041	672,842			
	State	10,393	4,632	5,761	2,400	2,820	10,981	52,772		
	Totals	1,339,282	462,840	876,442	460,519	325,208	1,662,169	202,913		

TABLE 1 (Continued)

THE STATUS OF RIBES ERADICATION IN THE PACIFIC COAST PROJECT AS OF DECEMBER 31, 1952
 PART B - OREGON

Control Operation	Class of Ownership	Control Units		Status of Ribes Eradication					Acres on Maintenance	
		Total Acres	Acres Unworked	Net Acres by Workings			First	Second	Other	
						Total				
National Forests										
Umpqua	Federal	2,699	180	2,519	120			2,639		
	Federal	64,293	1,332	59,961	35,768	34,058	129,787	12,052		
Rogue River	Private	2,889	244	2,645	1,666	3,093	7,404	588		
	Totals	67,182	4,576	62,606	37,434	37,151	137,191	12,840		
Klamath	Federal	1,615		1,615	1,615	1,587	4,817			
	Private	592		592	592	630	1,814			
	Totals	2,207		2,207	2,207	2,217	6,631			
TOTAL ALL NATIONAL FORESTS	Federal	68,607	4,512	64,095	37,503	35,645	137,243	12,052		
	Private	3,481	244	3,237	2,258	3,723	9,218	588		
	Totals	72,088	4,756	67,332	39,761	39,368	146,461	12,640		
National Parks										
Crater Lake	Federal	3,782	150	3,632	1,145	416	5,193	3,371		
Bureau of Land Management										
Medford*	Federal	Nat. For.	27,425	4,171	23,254	11,580	1,683	36,517	9,845	
	Federal	BLM	52,950	5,668	47,282	31,425	5,659	84,366	18,848	
	Federal	Totals	80,375	9,839	70,536	43,005	7,342	120,883	28,693	
	Federal	Private	12,158	973	11,185	5,483	432	17,100		
	Federal	State	637		637			637	1,976	
	Federal	Totals	93,170	10,812	82,358	48,488	7,774	138,620	30,669	
Totals for Oregon										
TOTAL ALL CONTROL OPERATIONS OREGON	Federal	Nat. For.	96,032	8,683	87,349	49,083	37,328	173,760	21,897	
	Federal	Nat. Park	3,782	150	3,632	1,145	416	5,193	3,371	
	Federal	BLM	52,950	5,668	47,282	31,425	5,659	84,366	18,848	
	Federal	Totals	152,764	14,501	138,263	81,653	43,403	263,319	44,116	
	Federal	Private	15,639	1,217	14,422	7,741	4,155	26,318		
	Federal	State	637		637			637	2,564	
	Federal	Totals	169,040	15,718	153,322	89,394	47,558	290,274	46,680	
PART C - TOTALS FOR THE PACIFIC COAST PROJECT										
CALIFORNIA AND OREGON	Federal	Nat. For.	668,332	211,017	457,315	233,574	175,436	866,325	80,482	
	Federal	Nat. Park	169,508	35,083	134,425	97,894	58,655	290,974	94,927	
	Federal	BLM	52,950	5,668	47,282	31,425	5,659	84,366	18,848	
	Federal	Totals	890,790	251,768	639,022	362,893	239,750	1,241,665	194,257	
	Federal	Private	606,502	222,158	384,344	184,620	130,196	699,160		
	Federal	State	11,030	4,632	6,398	2,400	2,820	11,618	55,336	
	Federal	Totals	1,508,322	478,558	1,029,764	549,913	372,766	1,952,443	249,593	

*Includes white pine management area and protective zone.

TABLE 2

SUMMARY OF RIBES ERADICATION IN THE PACIFIC COAST PROJECT - 1952

PART A - CALIFORNIA

Control Operation	Agency	Class of Work	Acres			Total Man Days	Thousands of Ribes Destroyed	Ownership of Acres Covered				
			Worked	Checked & Meeting Standards Without Work	Total			Nat. Forest	Nat. Park	HLM	Private	
Klamath	EQ-STATE	Reeradication	776	934	1,710	145	1				1,710	
	FS	Reeradication	245	916	1,161	116	7	1,161				
	TOTAL	Reeradication	1,021	1,850	2,871	261	8	1,161			1,710	
Shasta	EQ-STATE	Initial	327	108	435	288	40				435	
	FS	Initial	261	280	541	141	5	541				
	TOTAL	Initial	588	388	976	429	45	541			435	
Lassen	EQ-STATE	Initial	4,314	5,736	10,050	1,943	207				10,050	
		Reeradication	2,403	2,870	5,273	976	75				5,273	
		All	6,717	8,606	15,323	2,919	232				15,323	
	FS	Initial	523	375	898	228	22	898				
		Reeradication	472	1,010	1,482	218	12	1,482				
		All	995	1,385	2,380	446	34	2,380				
	TOTAL	Initial	4,837	6,111	10,948	2,171	229	898			10,050	
		Reeradication	2,875	3,880	6,755	1,194	87	1,482			5,273	
		All	7,712	9,991	17,703	3,365	316	2,380			15,323	
	EQ-STATE	Initial	518	330	848	200	48	106			742	
		Reeradication	2,179	979	3,158	508	74				3,158	
		All	2,697	1,309	4,006	708	122	106			3,900	
Plumas	FS	Initial	1,796	619	2,415	870	188	2,316			99	
		Reeradication	1,091	2,894	3,985	338	37	3,894			91	
		All	2,887	3,513	6,400	1,208	225	6,210			190	
	TOTAL	Initial	2,314	949	3,263	1,070	236	2,422			841	
		Reeradication	3,270	3,873	7,143	846	111	3,894			3,249	
		All	5,584	4,822	10,406	1,916	347	6,316			4,090	
Tahoe	EQ-STATE	Initial	119		119	137	20				119	
	FS	Initial	2,287	1,578	3,865	1,252	230	3,865				
	TOTAL	Initial	2,406	1,578	3,984	1,389	250	3,865			119	
Eldorado	EQ-STATE	Initial	865	100	965	399	104				965	
		Reeradication	4,620	4,334	8,954	2,523	280	40			8,914	
		All	5,485	4,434	9,919	2,922	384	40			9,879	
	FS	Initial	435		435	136	35	435				
		Reeradication	339		359	71	12	339				
		All	774		774	207	47	774				
	TOTAL	Initial	1,300	100	1,400	535	139	435			965	
		Reeradication	1,959	4,334	9,293	2,594	292	379			8,914	
		All	6,259	4,434	10,693	3,129	431	814			9,879	
Stanislaus	EQ-STATE	Initial	340		340	88	57				340	
		Reeradication	2,625	865	3,490	861	247				3,490	
		All	2,965	865	3,830	949	304				3,830	
	FS	Initial	801		801	591	515	801				
		Reeradication	952	3,205	4,157	406	73	4,157				
		All	1,753	3,205	4,958	997	588	4,958				
	TOTAL	Initial	1,141		1,141	679	572	801			340	
		Reeradication	3,577	4,070	7,647	1,267	320	4,157			3,490	
		All	4,718	4,070	8,788	1,946	892	4,958			3,830	
Sierra	EQ-STATE	Initial	32		32	19	10				32	
		Reeradication	601	1,023	1,624	463	55				1,624	
		All	633	1,023	1,656	482	65				1,656	
	FS	Initial	1,680	72	1,752	2,110	352	1,752				
		Reeradication	1,516		1,516	927	212	1,516				
		All	3,196	72	3,268	3,037	564	3,268				
	TOTAL	Initial	1,712	72	1,784	2,129	362	1,752			32	
		Reeradication	2,117	1,023	3,140	1,390	267	1,516			1,624	
		All	3,829	1,023	4,124	3,519	521	1,268			1,656	
Yosemite	NPS	Initial	2,578		2,578	4,357	465				2,578	
		Reeradication	2,500	5,970	8,470	2,287	415				8,470	
		All	5,078	5,970	11,048	6,644	880				11,048	
Sequoia-Kings Canyon	NPS	Initial	3,027	8,621	11,048	4,359	1,414				11,648	
		Reeradication	5,851	980	6,831	2,755	208				6,831	
		All	8,878	9,601	18,479	7,114	1,652				18,479	
ALL NATIONAL PARK SERVICE		Initial	5,605	8,621	14,226	8,716	1,909				14,226	
		Reeradication	8,351	6,950	15,301	5,042	623				15,301	
		All	13,956	15,571	29,527	13,758	2,532				29,527	
ALL EQ-STATE		Initial	6,515	6,274	12,789	3,074	486	106			12,683	
		Reeradication	13,204	11,005	24,209	5,476	732	40			24,169	
		All	19,719	17,279	36,998	8,550	1,218	146			36,852	
ALL FOREST SERVICE		Initial	7,783	2,924	10,707	5,328	1,347	10,608			99	
		Reeradication	4,615	8,025	12,640	2,076	353	12,519			91	
		All	12,398	10,949	23,347	7,404	1,700	23,157			190	
ALL CALIFORNIA		Initial	19,903	17,819	37,722	17,118	3,742	10,714	14,226		12,782	
		Reeradication	26,170	25,980	52,150	12,594	1,708	12,589	15,301		24,260	
		All	46,073	43,799	89,872	29,712	5,450	23,303	29,527		37,042	

TABLE 2 (Continued)

SUMMARY OF RIBES ERADICATION IN THE PACIFIC COAST PROJECT - 1952

PART B - OREGON

Control Operation	Agency	Class of Work	Acres			Total Man Days	Thoucande of Ribes Destroyed	Ownership of Acres Covered			
			Worked	Checked & Meeting Standards Without Work	Total			Federal	Nat. Forest	Nat. Park	
Umpqua	FS	Initial	240		240	16		240			
		Reeradication	120		120	13	1	120			
		All	360		360	23	1	360			
Rogue River	FS	Initial	357		357	77	1	357			
		Reeradication	3,926	1,847	5,773	1,080	47	4,833		940	
		All	4,283	1,847	6,130	1,157	48	5,190		940	
Klamath	FS	Reeradication	1,095	992	2,087	415	6	1,587		500	
Medford	BLM	Initial	1,410	3,334	4,744	424	34	1,151		2,598 995	
		Reeradication	7,946	3,347	11,293	1,160	15	1,683		7,505 2,105	
		All	9,356	6,681	16,037	1,584	49	2,834		10,103 3,100	
ALL FOREST SERVICE		Initial	597		597	87	1	597			
		Reeradication	5,141	2,839	7,980	1,508	54	6,540		1,440	
		All	5,738	2,839	8,577	1,595	55	7,137		1,440	
ALL OREGON		Initial	2,007	3,334	5,341	511	35	1,748		2,598 995	
		Reeradication	13,087	6,186	19,273	2,668	69	8,223		7,505 3,545	
		All	15,094	9,520	24,614	3,179	104	9,971		10,103 4,540	

PART C - TOTALS FOR THE PACIFIC COAST PROJECT

ALL EQ-STATE OF CALIFORNIA	Initial	6,515	6,274	12,789	3,074	486	106			12,683
	Second	5,820	3,811	9,631	2,392	366				9,631
	Other	7,384	7,194	14,578	3,084	366	40			14,538
	All Reerad.	13,204	11,005	24,209	5,476	732	40			24,169
	All	19,719	17,279	36,998	8,550	1,218	146			36,852
ALL FOREST SERVICE	Initial	8,380	2,924	11,304	5,415	1,348	11,205			99
	Second	3,087	1,089	4,176	1,448	260	4,156			20
	Other	6,669	9,775	16,444	2,136	147	14,933			1,511
	All Reerad.	9,756	10,864	20,620	3,584	407	19,089			1,531
	All	18,136	13,788	31,924	8,999	1,755	30,294			1,630
ALL NATIONAL PARK SERVICE	Initial	5,605	8,621	14,226	8,716	1,909			14,226	
	Second	4,542	4,140	8,682	3,492	509			8,682	
	Other	3,809	2,810	6,619	1,550	114			6,619	
	All Reerad.	8,351	6,950	15,301	5,042	623			15,301	
	All	13,956	15,571	29,527	13,758	2,532			29,527	
ALL BUREAU OF LAND MGMT.	Initial	1,410	3,334	4,744	424	34	1,151			2,598 995
	Second	5,128		5,128	454	2				3,455 1,673
	Other	2,818	3,347	6,165	706	13	1,683			4,050 432
	All Reerad.	7,946	3,347	11,293	1,160	15	1,683			7,505 2,105
	All	9,356	6,681	16,037	1,584	49	2,834			10,103 3,100
CALIFORNIA AND OREGON	Initial	21,910	21,153	43,063	17,629	3,777	12,462	14,226	2,598	13,777
	Second	18,577	9,040	27,617	7,786	1,137	4,156	8,682	3,455	11,324
	Other	20,680	23,126	43,806	7,476	640	16,656	6,619	4,050	16,481
	All Reerad.	39,257	32,166	71,423	15,262	1,777	20,812	15,301	7,505	27,805
	All	61,167	53,319	114,486	32,891	5,554	33,274	29,527	10,103	41,582

TABLE 3
SUMMARY OF CHEMICAL WORK IN THE PACIFIC
COAST PROJECT - 1952

Control Operation	Agency	Acres Covered	Total Man Days	Thousands of Ribes Destroyed	Thousands of Gallons of Spray Used
Rogue River	FS	231	31	1	-
Plumas	FS	33	100	50	7
Eldorado	EQ-State	26	46	16	6
Stanislaus	FS	190	191	285	71
Sierra	FS	70	146	90	38
Yosemite	NPS	105	225	229	33
Sequoia-Kings Canyon	NPS	1,885	682	515	32
Agency Totals	EQ-State	26	46	16	6
	FS	524	468	426	116
	NPS	1,990	907	744	65
Grand Totals - 1952		2,540	1,421	1,186	187
Accumulative Grand Totals - 1946-1952		10,777	13,181	14,496	1,843

TABLE 4
SUMMARY OF RIBES ERADICATION BY CONTRACT-1952

Control Operation	Agency	Acres Worked By Contractors	Eradication Man Days	Thousands of Ribes Destroyed	Average Price Per Acre Paid To Contractor
All Workings (Initial and Reeradication)					
California Klamath	EQ-State	167	44	1	\$ 6.18
	EQ-State	284	252	40	6.70
Shasta	FS	232	109	5	5.83
	Total	516	361	45	6.31
Lassen	EQ-State	6,338	1,879	245	6.54
	FS	995	264	34	6.07
	Total	7,333	2,143	279	6.48
Plumas	EQ-State	2,697	542	122	6.84
	FS	2,774	810	175	6.61
	Total	5,471	1,352	297	6.72
Tahoe	EQ-State	119	127	20	8.62
	FS	2,287	928	230	7.10
	Total	2,406	1,055	250	7.17
Eldorado	EQ-State	4,043	1,162	228	6.38
	FS	774	176	47	5.55
	Total	4,817	1,338	275	6.25
Stanislaus	EQ-State	2,965	779	304	4.53
	FS	1,563	621	303	7.13
	Total	4,528	1,400	607	5.43
Sierra	EQ-State	633	363	65	6.02
	FS	1,766	1,009	272	5.81
	Total	2,399	1,372	337	5.87
Yosemite	NPS	872	340	60	7.97
Seq-Kings Can.	NPS	733	933	229	18.97
Oregon					
Rogue River	FS	2,544	401	35	3.96
Klamath	FS	465	249	3	8.83
Medford	BLM	1,861	840	43	6.75
Agency Totals	EQ-State	17,246	5,148	1,025	6.20
	FS	13,400	4,567	1,104	6.11
	NPS	1,605	1,273	289	12.99
	BLM	1,861	840	43	6.75
Grand Total - 1952		34,112	11,828	2,461	\$ 6.51
Accumulative					
Grand Totals - 1946-1952		140,660	47,369	8,255	\$ 5.52

TABLE 5

SUMMARY OF CHECKING IN THE PACIFIC COAST PROJECT - 1952

Control Operation	Agency	Acres Covered By Checks				Total Strip Acres	Total Checking Cost (Dollars)
		Regular	Advance	Post	Total		
California							
Klamath	EQ-STATE	1,060		2,280	3,340	164	1,850
	FS			1,148	1,148	67	1,200
Shasta	EQ-STATE	980			980	55	640
	FS	860			860	41	640
Lassen	EQ-STATE	8,672	5,770	5,850	20,292	925	15,240
	FS	1,388	2,295	461	4,144	206	4,162
Plumas	EQ-STATE	3,372	771	4,009	8,152	315	3,576
	FS	4,077	1,790	8,524	14,391	473	5,914
Tahoe	EQ-STATE	256	425		681	35	133
	FS	2,467	8,080		10,547	458	5,773
Eldorado	EQ-STATE	8,333	140	6,381	14,854	613	6,161
	FS	1,299	300	1,251	2,850	160	1,844
Stanislaus	EQ-STATE	4,049	405	6,067	10,521	394	3,873
	FS	2,375		6,480	8,855	385	4,250
Sierra	EQ-STATE	775	3,850	2,310	6,935	243	2,363
	FS	5,089	3,085	2,995	11,169	436	2,085
Yosemite	NPS	4,387	3,196	2,124	9,707	404	3,731
Sequoia-Kings Canyon	NPS	4,310	10,415	3,565	18,290	920	6,227
CALIFORNIA TOTALS		53,749	40,522	53,445	147,716	6,294	69,662
Oregon							
Umpqua	FS		200		200	12	45
Rogue River	FS	3,639		6,080	9,719	802	6,193
Klamath	FS	771		734	1,505	102	1,411
Medford	BLM	2,740			2,740	138	1,156
OREGON TOTALS		7,150	200	6,814	14,164	1,054	8,805
Pacific Coast Project							
AGENCY TOTALS	EQ-STATE	27,497	11,361	26,897	65,755	2,744	33,836
	FS	21,965	15,750	27,673	65,388	3,142	33,517
	NPS	8,697	13,611	5,689	27,997	1,324	9,958
	BLM	2,740			2,740	138	1,156
GRAND TOTALS		60,899	40,722	60,259	161,880	7,348	78,467

TABLE 1

FISCAL YEAR ALLOTMENTS FROM WHICH EXPENDITURES WERE MADE IN THE
PACIFIC COAST PROJECT DURING THE CALENDAR YEAR 1952

Federal Funds		
<u>Agency</u>	<u>Fiscal Year 1952</u>	<u>Fiscal Year 1953</u>
Bureau of Entomology and Plant Quarantine	\$ 212,000	\$ 208,700
Forest Service Region 5 (California)	355,000	360,000
Forest Service Region 6 (Oregon)	48,000	60,000
National Park Service:		
Yosemite National Park	151,425	148,000
Sequoia-Kings Canyon National Parks Regional Office	146,089 26,364	122,190 18,780
Bureau of Land Management	<u>47,000</u>	<u>44,100</u>
Total Federal Funds	\$ 985,878	\$ 961,770*
Cooperative Funds		
State of California	\$ 168,437	\$ 168,437
Michigan-California Lumber Company	2,000	2,000
Stockton Box Company	<u>200</u>	<u>200</u>
Total Cooperative Funds	\$ 170,637	\$ 170,637*
Total All Funds	\$1,156,515	\$1,132,407

* Figures in this column represent allotments as they are known as of December 31, 1952 and are subject to change until June 30, 1953.

TABLE 2

EXPENDITURES IN THE PACIFIC COAST PROJECT FOR THE CALENDAR YEAR 1952

Federal Funds

	California Fiscal Year 1952 1/1/52-6/30/52	Oregon Fiscal Year 1953 7/1/52-12/31/52	Federal Funds	California Fiscal Year 1952 1/1/52-6/30/52	Oregon Fiscal Year 1953 7/1/52-12/31/52	Region Total
Bureau of Entomology and Plant Quarantine	\$114,449	\$100,443	:	\$ 9,148	\$ 9,350	\$ 233,390
Forest Service Region 5	148,652	182,685	:	-	-	331,337
Forest Service Region 6	-	-	:	16,587	34,596	51,183
National Park Service:						
Yosemite National Park	58,188	109,395	:	-	-	167,583
Sequoia-Kings Canyon National Parks	65,041	109,127	:	-	-	174,168
Regional Office	14,614	9,903	:	-	-	24,517
Bureau of Land Management	-	-	:	16,180	20,991	37,171
Total Federal Funds	\$400,944	\$511,553	:	\$41,915	\$64,937	\$1,019,349
Cooperative Funds						
State of California	\$ 27,134	\$125,875	:	-	-	\$ 153,009
Michigan-California Lumber Company	-	-	:	-	-	-
Stockton Box Company	-	-	:	-	-	-
Total Cooperative Funds	\$ 27,134	\$125,875	:	-	-	\$ 153,009
Total All Funds	\$428,078	\$637,428	:	\$41,915	\$64,937	\$1,172,358

TABLE 3

STATEMENT OF ALLOTMENTS BY FISCAL YEARS FOR RIBES ERADICATION
ON STATE AND PRIVATE LANDS

Fiscal Years	State of California Contributions		Private Cash Contributions	Total State and Private	BEPQ Allocations			Total State Private and Bureau
	Cash	Other			3101.14 71.14 W-a.14	3103.14 73.14 W-e.14	Total and W-a.W	
1942	\$ 25,000		25,000	\$ 25,000	\$ 25,000	\$ 61,370	\$ 86,370	\$ 14,525
1943	25,000		25,000	6,000	31,000	71,000	71,000	112,770
1944	50,000		50,000	6,000	56,000	82,825	86,195	169,020
1945	50,000		50,000	4,000	54,000	83,216	85,040	168,256
1946	75,000		20,410	5,000	100,110	95,250	271,125	366,375
1947	75,000	74,860	119,860	5,000	151,060	137,022	563,000	700,022
1948	125,000	48,112	173,142	5,000	178,142	126,000	130,000	256,000
1949	153,125	43,044	196,169	5,000	201,162	136,459	115,440	251,829
1950	168,437	35,291	204,431	1,000	208,431	130,259	105,000	232,959
1951	168,437	26,237	194,674	2,200	196,874	137,000	100,000	237,000
1952	168,437	16,351	184,788	2,200	186,988	102,000	103,000	212,000
1953	168,437	8,237	176,674	2,200	178,874	102,700	99,000	208,700
Totals	1,251,373	273,275	1,525,118	1,5600	1,571,718	1,282,801	1,711,195	3,027,296
Accumulative Expenditures 7/1/41 to 12/31/52								1,529,744
								\$4,403,534
								\$2,930,021
								\$1,692,538
								\$1,237,183
								\$1,473,513
								\$1,267,867
								\$1,155,838
								\$1,273,275
								\$1,155,838



This splendid stand of giant sugar pines, mixed with other valuable trees, is characteristic of thousands of acres of state and privately owned timberlands.



On cutover land such as this, the young sugar pines are abundant. The State of California through its Division of Forestry, Department of Natural Resources, has continuously supported a program to protect this valuable timber resource from blister rust damage.



Back-pack sprayers with solutions of toxic 2,4-D or 2,4,5-T are used widely throughout the region. Basal stem treatment of ribes proved to be effective in areas like this.



Ribes roezli bush completely killed by 2,4-D spray. This method of destroying ribes avoids disturbance of the soil and lessens the likelihood of seed germination following the treatment.



A disease survey crew is shown recording data at the site of a blister rust infection. Canker analysis and study of the infections provide valuable information used in planning control measures.



The remanents of western white pine at timber line on Mt. St. Helens, Washington, illustrate graphically the fate of pines outside control units. Blister rust in this vicinity has made serious inroads where protection work has not been performed.



A pure stand of foxtail pine on the Chagoopa Plateau in the Sequoia-Kings Canyon National Park. The preservation of such stands of this rare white pine has been one of the major projects of the National Park Service.



The foxtail pines in this picture grow on a glacial moraine at timber line elevation. These rugged, picturesque trees are being protected from white pine blister rust in the Sequoia-Kings Canyon National Park.



The close association of ribes with white bark pine is clearly shown in this photograph made at a high elevation in the Sierra Nevada Mountains of California. Where ribes grow in patches, such as shown, toxic chemicals are often used to kill them.



Frequently at high elevations where ancient glaciers have scarred the earth's surface and left barren granite slopes there will be found scattered patches of white pines. This photograph, made at Tenaya Lake in Yosemite National Park, illustrates aesthetic values in white pine timber that make blister rust control desirable.

DEVELOPMENT AND IMPROVEMENT OF CONTROL METHODS IN THE PACIFIC COAST
PROJECT FOR 1952

By C. R. Quick, D. R. Miller, and W. S. Burrill

SECTION I. HIGHLIGHTS OF THE YEAR 1952.

Ribes Ecology

Organization of the ribes ecology program was discussed with BRC operations men in May 1952. As a result of this meeting certain groups of ecology plots are being completed or abandoned, and other groups are being expanded. Special emphasis is to be placed on studies dealing with ribes regeneration subsequent to recently-developed forest practices resulting from such concepts as the "unit area control" concept of Timber Management Research, California Forest Experiment Station.

Seedling data from ribes and associated species of brush are being collected at present from some 225 milacres on the experimentally-logged portions of the Dodge Ridge Tract, near Pinecrest, Stanislaus N.F. Similar groups of milacre plots are located on Collins Pine land near Wilson Lake and near Humbug Valley, Lassen N.F.

Several of the one-acre ribes regeneration plots continue to yield interesting data. Because of restrictions on report space, no data from these plots are included in this year's annual report.

Data from grazing exclosure studies are about complete, and these plots will be abandoned in the near future. Exclusion of grazing from BRC areas would somewhat simplify immediate control of Ribes roezli and eventual complete eradication, but in general other factors are of greater importance.

A new group of milacre plots was initiated in September 1952 on a bulldozer denuded area on the periphery of one part of the Feather River conflagration of September 1951. Two brush removal plots of 50 milacres each, 1 in dense mixed brush near Cow Creek G.S., Stanislaus N.F., and the other in dense deerbrush on Big Bar Mt. ridge were initiated in the fall of 1952.

Chemical Methods

Plots to compare treatments of R. roezli with the isopropyl ester of 2,4-D, both basal-stem treatment and dilute-aqueous spray, both in heavy brush and in the open, were initiated in 1951 on the Plumas N.F. (Davis Creek road, near Camel Peak) and on the Sierra N.F. (Brown's Creek area, Whisky Ridge). Basal-stem treatments averaged 20% better in general than dilute-aqueous sprays (82% vs. 62% bush kill). Basal-stem tests in the open were somewhat more successful than in brush (87% vs. 76%). Old gooseberry bushes growing in dense brush continue to be very hard to kill with aqueous sprays.

Seasonal differences of effectiveness are much greater for dilute-aqueous sprays than for basal-stem treatments. Seasonal basal-stem effects are more noticeable on older bushes; younger age groups of R. roezli bushes can be treated effectively by the basal-stem method at any time during the season.

A series of replicated tests compared the effectiveness of the sodium salt of 2,4-D (Monohydrate) with the triethanolamine salt of 2,4-D in dilute-aqueous sprays at 500 ppm acid equivalent. In tests during the normal spray season the amine form gave better kills than the sodium salt (92% vs. 55%). Results of very early season and very late season treatments differed from this generalization.

In another group of tests during the normal spray season, the butoxy-ethanol ester of 2,4-D resulted in better kills than the isopropyl ester (86% vs. 75%). Several new chemicals and new formulations of old chemicals were put on plots first in 1951. Tests of the more promising ones were applied again in 1952. One rather high priced and insoluble chemical of some promise, called CMU, or 3-(para-chlorophenyl)-1,1-dimethylurea, was applied in suspension in dilute-aqueous spray and as dry pelletized material. CMU perhaps is best classified as a temporary soil sterilant. It is relatively non-selective, but may find some specialized uses in BRC, on clumps of R. cereum, for example.

The defoliation tests started in 1950 indicate that R. roezli can be successfully defoliated by single treatments, and killed by repeated treatments, of 25 ppm 2,4-D plus 1% summer oil in aqueous spray.

During July 1952, in cooperation with the Special Equipment Center of the Bureau of Entomology and Plant Quarantine, 6 plots (160 acres) were sprayed with low dosages of 2,4-D ester in Diesel oil, and one plot (20 acres) was treated with a 2,4-D pellet containing a volatile ester. Plots were located on the Stanislaus N.F. and were intended as R. roezli plots. Results of both sprays and pellets were sufficiently encouraging to justify further tests of these methods. The 2,4-D pellets reached the ground satisfactorily and appear to be highly selective on the sensitive R. roezli and to have little or no toxicity to valuable trees and shrubs that are more than 2 feet tall. Sprays are intercepted to a marked degree by trees and shrubs that are taller than ribes and their successful use will depend on the development of more selective and more readily translocated herbicides--a study that is being vigorously undertaken.

Disease Studies and Rust Spread

There was no significant long-distance spread of the rust in 1952 from pine to ribes, but local spread and very favorable conditions for rust intensification on ribes leaves produced a great abundance of very heavily rusted bushes in many favorable areas.

Of 1160 samples of rust on ribes leaves submitted for rust species determination, only 17 samples were identified as blister rust. These determinations must still be made by laboratory methods that require considerable judgment.

Buildup of rust on sugar pine in the Sierra Nevada continues to be slow, and in marked contrast to buildup in rust-hazardous areas of the Cascade and Siskiyou Mts., where severe damage to pole stands and even to young mature stands is now notable.

Disease studies were continued in 1952 in the Mill Creek area, Rogue River Valley, north of Prospect, Oregon. The amount of pine infection and the distance of rust spread resulting from very small amounts of Ribes sanguineum live stem were the more important aspects of these studies. Results of this study will be given in a special report.

SECTION II. RIBES ECOLOGY IN CALIFORNIA AND SOUTHERN OREGON, 1952

Scope of the ribes ecology program and placement of emphasis within the program were discussed with BRC operations men in May 1952. Studies of ribes regeneration following the "unit area control" type of timber management and "condition class" cuttings in California, and the "stage cutting" practices in southern Oregon, were suggested for special emphasis. Methods for the accurate prediction of amount and vigor of ribes regeneration following specific cuttings of individual stands of timber were also stressed. Studies dealing with ribes regeneration after severe burns, regeneration in relation to grazing, and regeneration after the "risk type" cuttings of the recent past were believed to be of lesser importance. These latter studies are being tapered off to completion. The type of forest management envisioned by Vaux in his economic study of sugar pine likewise involves frequent cuttings. This type of management, as well as methods of cutting already used experimentally, should determine additions to the ribes ecology program.

Dodge Ridge Tract

The writer now collects seedling regeneration data on ribes and associated brush from the following plots on the Dodge Ridge Tract experimentally-logged areas: (1) 50 randomized milacres in sec. 27, T4N, R14E (Landings #1 and #2, 1948), (2) 50 randomized milacres in sec. 26 (Landing #3, 1948), (3) a group of 25 mil-acres in sec. 27 (Landing #1, 1948), (4) a group of 25 milacres in sec. 26 (Landing #4, 1949), (5) group of 25 milacres in sec. 27 (Landing #5, 1949), (6) 25 milacres in sec. 28 (Landing #6, 1949), and (7) 25 milacres in sec. 28 (Landing #7, 1949). RIBES ON THE DODGE RIDGE TRACT

Table 1 presents data, collected 1949-1952 from the plots listed above, which relate to seedling occurrence and survival of Ribes, Ceanothus, and Arctostaphylos. Observe the larger numbers of ribes seedlings occurring around Landing #3, which was added to the local BRC unit in 1948 just prior to logging, than around Landings #1 and #2, which have long been in the BRC unit. Ceanothus seedlings, for one reason or another, are most abundant around Landing #5, but are generally distributed in considerable numbers over the various areas. Manzanita seedlings also are widely distributed, but on specific areas are generally fewer than Ceanothus seedlings.

Cow Creek 5.6-Acre Plot (CFES, MC#12)

In August of 1936 an accidental fire burned a "hole" of approximately 1.5 acres in CFES plot MC#12, a virgin-forest plot of the Methods of Cutting series. The burn was followed by the appearance in 1937 of many gooseberry and associated brush seedlings. Most of the area had become densely brushy by 1947, largely by growth of snowbrush (Ceanothus cordulatus) seedlings.

Table 4, page 116, of the Annual Report for 1944, presents data on ribes occurrence and growth collected 1937-1944 from seedlings appearing just after the burn. All known ribes were eradicated by the writer in 1947. Table 2 presents some of the data collected 1950-1952 from ribes seedlings of recent origin growing on this area. Comparison of the growth rates of R. roezli established in 1937-1944, with those of 1948-1952, as given in table 2, indicates the marked loss of vigor shown by R. roezli when competing with vegetation which has more or less occupied a site. For example, it is observed that 3-year-old bushes in 1940 averaged about 2.84 feet of total live stem, RIBES GROW SLOWLY IN BRUSH

while in 1952 on the same area, 3-year-old bushes (1949 year-of-origin) averaged only 7.0 inches of live stem.

Chowchilla Mt. Grazing Exclosure

Four groups of fenced plots, each with eight 1/40-acre subplots, were established in the fall of 1940. All observed ribes were removed at time of plot initiation. Data on occurrence survival and growth of ribes seedlings subsequent to the 1940 eradication were collected annually from all subplots. All known ribes were removed again in 1947. Table 4 presents some data collected 1941-1947 from the exclosure plot (Chowchilla Mt., Sierra N.F.) on which developed subsequent to the 1940 eradication the most vigorous gooseberry population of the plot series.

Observe that in 1941 more current-season seedlings were found inside the fence than outside, but that in all succeeding years more current-season seedlings were found outside. The proportion of outside to inside current-season seedlings increases progressively with the passing years. Of the many seedlings originating in 1941, observe that 6.1% (114/1857) survived to 1947 outside the fence, but that 9.9% (192/1933) survived inside the fence. However, in 1947 there were 1160 feet of live stem on the 192 1947-origin ribes inside the fence, but 1896 feet on the 114 1941-origin ribes outside the fence. Thus in 1947 the average size of 1941-origin ribes was 6.0 feet of live stem inside the fence, and 16.6 feet outside. Not summarized in table 4 are data which show that during the period 1941-1947 more bushes fruited inside the fence, but also show that many more fruits--both total and per fruiting bush--were produced outside the fence.

In general, then, the slow-down of ribes growth and vigor was considerably more inside the fence than outside where cattle grazing has been regular and moderately heavy over the years since plot initiation. Immediate control and eventual eradication of R. roezli are somewhat simpler problems within the exclosures.

New Plot Initiated

One portion of the Feather River conflagration of Sept. 1951 was stopped at the RR-grade road between Coyote Gap and Big Bar L.O., Big Bar Mt., Plumas N.F., about a mile west of Coyote Gap. In this area the north-facing slope of Big Bar ridge supports a tall dense mixture of brush which is thoroughly discouraging to ribes eradicators. The mature brush also precludes development of additional sugar pine crop trees. The Gentle Gully one-acre ribes-regeneration plot, established in 1940, lies in the shallow drainage above the road at this point. The one-acre plot was not disturbed by the fire, but a bulldozed line around a spot fire above the road just east of the plot missed the east boundary of the plot by about 1/4 chain. An area somewhat wider than a fire line was scraped off by a bulldozer just above the road northeast of the plot. It is believed that a small spot fire was here extinguished by simply scraping the entire small area with the bulldozer blade. In September 1950 a plot of 25 mil-acres was staked out on this scraped area, and a study of the re-vegetation of this rather completely denuded spot was initiated.

Table 3 lists all seedlings and resprouts found on these 25 mil-acres in September 1952.

Table 1. Current-season seedlings of principal species of brush, found on Dodge Ridge experimentally logged areas.

Year of inspec- tion	No. of current-season seedlings; by yr. of logging and landing number						Totals		Means per milacre	
	Logged 1948			Logged 1949**			Logged	Logged	Logged	Logged
	1*	1&2	3	4	5	6	1948	1949	1948	1949
Ribes species. (Largely <i>Ribes roezlii</i>)										
1949	--	60	177	--	--	--	237	--	2.32	--
1950	6	26	90	2	1	5	122	8	.80	.11
1951	7	22	69	0	3	11	98	14	.64	.19
1952	1	4	19	1	4	5	24	10	.16	.13
Total	14	122	355	3	8	21	481	32	--	.43
Ceanothus species. (Largely <i>C. cordulatus</i> and <i>C. parvifolius</i> .)										
1950 #	13	35	30	20	68	30	78	118	.51	1.57
1951	19	28	8	20	73	53	55	146	.36	1.95
1952	37	16	13	9	47	8	66	64	.44	0.85
Total	69	79	51	49	188	91	199	328	1.31	4.37
Manzanita species. (Largely <i>Arctostaphylos patula</i> .)										
1950 #	3	20	2	9	11	3	25	23	.16	0.31
1951	20	59	0	22	29	85	79	136	.52	1.81
1952	8	6	2	8	7	11	16	26	.11	0.35
Total	31	85	4	39	47	99	120	185	.79	2.47

*A 1/20-acre plot (50 milacres). Samples from landings 1 & 2, and from landing 3 were 52 and 50 randomized milacres respectively. Landings 3 and 4 are in the NW 1/4, sec. 26, T4N, R18E, from which ribes were first systematically removed in 1948. The other landings are in parts of secs. 27 and 28 which have been within BRC units for several years.

**Each sample from the 1949-logged areas consists of a 1/40-acre (25-mil-acre) plot.

Not recorded in 1949.

Table 2. Occurrence and growth of ribes on an area of the 5.6-acre plot (CFES-MC#12), burned in 1936 and eradicated in 1947.

Year of ribes origin	Number of ribes found at inspections			Average size of ribes, inches of TLS*		
	1950	1951	1952	1950	1951	1952
1952	--	--	12	--	--	0.5
1951	--	34	2	--	0.4	1.7
1950	21	8	1	0.3	1.6	3.5
1949	29	23	11	1.3	2.8	7.0
1948	11	8	8	3.2	4.9	8.0
Total	61	73	34	1.3	1.8	4.5
Older	12	10	14	33.1	28.1	50.1

*TLS = total linear live stem.

Table 3. Current-season seedlings and resprout stems found Sept. 6, 1952, at initiation of Gentle Gully denuded milacres.

Code	Plant species	Seedlings		Resprouts	
		No. of plants	Milacres stocked	No. of sprouts	Milacres stocked
Fir	Firs (Doug. firs, white fir)	311	25	1	1
IC	Incense cedar	4	4	--	--
PP	Ponderosa pine	2	2	--	--
TBO	Tan-bark oak (Lithocarpus)	77	17	225	2
BO	Black oak (Q. kelloggii)	--	--	--	2
BLM	Big-leaf maple (Acer macrophyllum)	18	14	--	--
CN	Dogwood (Cornus nuttallii)	11	6	--	--
CI	Deerbrush (Cean. integrifolius)	55	15	--	--
CR	Hazelbrush (Corylus rostrata)	--	--	5	3
SS	Willow (Salix scouleriana?)	4	2	--	--
SG	Elderberry (Sambucus glauca)	1	1	--	--
AP	Manzanita (Arctostaphylos patula?)	1	1	--	--
RR	Gooseberry (Ribes roezlii)	24	12	--	--
RN	Currant (Ribes nevadense)	12	7	--	--
RP	Thimbleberry (Rubus parviflorus)	11	9	81	8
SM	Waxberry (Symphoricarpos)	--	--	110	6
RS	Rose (Rosa spithamea?)	--	--	1	1
PA	Bracken (Pteris aquilina)	--	--	24	5
VL	Violet (Viola lobata?)	--	--	29	3
--	Other herbaceous species	31	?	9	4
Total		562	25	513	16

Table 4. Occurrence and growth of *Ribes roezli* inside and outside fence of Chowchilla Mt. exclosure plot, 1941-1947.

Year of bush origin	Year of inspection	Number of ribes plants found	Total live stem (feet) on known ribes		Mean live stem (feet), per known ribes plant	
			Inside	Outside	Inside	Outside
1941	1941	1933	1857	40	39	0.02
	1942	299	239	50	46	0.16
	1943	201	151	153	101	0.76
	1944	189	117	458	230	2.43
	1945	153	116	818	636	5.35
	1946	158	108	1108	1278	7.02
	1947	192	114	1160	1896	6.04
1942	1942	856	862	18	18	0.02
	1943	60	145	6	18	0.10
	1944	34	134	13	54	0.37
	1945	33	120	34	152	1.04
	1946	35	93	59	294	1.68
	1947	34	99	59	446	1.73
1943	1943	19	97	0.5	1.9	0.02
	1944	7	18	0.6	1.6	0.08
	1945	6	16	2.3	14.0	0.37
	1946	4	20	3.6	48.4	0.90
	1947	7	19	3.9	63.3	0.56
1944	1944	25	330	0.5	6.9	0.02
	1945	1	67	0.1	11.8	0.08
	1946	0	40	0.0	25.5	0.00
	1947	1	34	1.8	24.3	1.75
1945	1945	0	139	0.0	2.9	0.00
	1946	4	26	0.3	6.3	0.08
	1947	0	19	0.0	9.3	0.00
1946	1946	1	126	0.1	2.6	0.02
	1947	0	10	0.0	0.6	0.00
	1947	1947	0	0.0	0.9	0.00
Totals all bush ages	1941	1933	1857	40	39	0.02
	1942	1155	1101	68	64	0.06
	1943	280	393	160	121	0.57
	1944	255	599	472	293	1.85
	1945	193	458	854	817	4.47
	1946	202	413	1171	1655	5.85
	1947	234	340	1225	2440	5.24

SECTION III. DEVELOPMENT OF IMPROVED HERBICIDES FOR RIBES ERADICATION WORK.

RESULTS OF 1951 FIELD WORK

Basal Stem Tests

The diluent for almost all basal-stem tests made in 1951 was Diesel oil. A weedkilling oil with high aromatic content (e.g. Avon Annalos #11) and a half-and-half mixture of Diesel oil and the weedkilling oil were also used in some tests with dye as an experimental marker, and in a few tests applied in August and September.

BASAL STEM TESTS Results from basal-stem plots on the Plumas N.F. in late June and mid-August, and from the Sierra N.F. in early June, were rather uniformly good. Tests on the Sierra in June were about 20% higher than similar tests made in late August (95% vs. 75%). See table 6. 2,4,5-T was more effective than 2,4-D in August tests on the Sierra N.F. (Means of 81% vs. 70%) for concentrations of 1.0%, 2.5% and 5.0%. Butoxyethanol ester of 2,4,5-T at 2.5% concentration (100% kill), the same at 5% (98% kill), and the isopropyl ester of 2,4-D at 5% (95% kill) gave the best results in these August tests.

Certain new chemicals, an amine salt of 2,4,5-T (ACP #965), the butoxyethanol ester of 2,4-D and 2,4,5-T with high content of emulsifier (ACP #977), and the butoxyethanol ester of MCP (2-methyl-4-chlorophenoxy acetic acid) showed considerable promise with an average kill of 92%. No

NEW HERBICIDES APPLIED IN 1951 new chemical was markedly better than the old chemicals in the Plumas N.F. tests, however. Bush kill on the Sierra in August was 91% from these new formulations and 75% from the old ones. All three of these chemicals were about equally effective. The 5% tests averaged somewhat better than the 1% tests (95% vs. 89%). Four basal stem tests initiated on the Sierra in May, using Nigrosine Black dye as a marker, in 5% butoxyethanol ester of 2,4-D or 2,4,5-T, averaged 98% bush kill. Several tests on September 12 on the Sierra concerned additions of a special penetrant-depositant material (e.g. Multifilm L) to 5% butoxyethanol ester of 2,4-D in an aromatic weedkiller oil. These "fortified" oil treatments averaged somewhat better than the controls (86% vs. 77% bush kill). Variations of actual plant tissue treated in basal-stem tests were made with the isopropyl ester of 2,4-D and of 2,4,5-T. The regular, or standard, treatment was compared with an experimental light (low volume) treatment, and with a

BASAL STEM TREATMENTS VARIED narrow (thin) band treatment. The narrow band treatment was best of the three, both on the Plumas N.F. and on the Sierra N.F. The regular treatment gave better results than the light or low-volume treatment on the Sierra, but only equaled the low volume treatment on the Plumas (table 7). The much greater time and care necessary to completely apply only a narrow band of chemical on all stems is the probable explanation of the seeming superiority of the narrow band method.

A group of tests comparing the effectiveness of the isopropyl ester of 2,4-D applied as basal stem treatment and as dilute spray was put on R. roezli in heavy brush and in the open. Basal stem tests in the open were somewhat better than in the brush (87% vs. 76%, table 9). Basal stem treatments averaged 20% better than dilute sprays (82% vs. 62%, table 9).

Dilute Spray Tests

Most dilute-aqueous tests made in 1951 consisted of 5 gallons of solution sprayed on a 1/2-square-rod plot. All 1951 solutions contained 1% summer oil, except (1) a series of tests using butoxyethanol esters, (2) three tests which included propylene glycol, and (3) tests involving special emulsifiers, and additions of Diesel oil.

About 50% of the buds on R. roezli bushes sprayed on May 23 and 24 on the Sierra N.F. were in the closed-bud stage. Bush kills were good on some plots sprayed under these conditions. One plot of the triethanolamine salt of 2,4-D (Killtox 40) resulted in a 100% kill (table 8). Three replicated tests at this early date with this amine of 2,4-D at 500 ppm gave a higher percent kill on R. roezli than did three similar tests with the sodium salt of 2,4-D (81% vs. 65%); see table 8. The lowest bush kill (50%) from this set of 6 plots was from a plot recorded as having 50% to 75% of buds in closed-bud stage at the time of spraying. It thus appears that seasonal development of some bushes involved in this set of tests was not sufficient for satisfactory treatment.

Some plants of R. roezli were still flowering on the Sierra plot area on June 10, and some had pea-sized fruits. Bush kill on many plots treated at this time was good; for example, triplicate tests with triethanolamine salt of 2,4-D at 500 ppm gave 100%, 92%, and 85% kills (table 8); 250 and 1000 ppm of an amine of 2,4,5-T (ACP #965) gave 92% and 85% kills; and 1000 and 500 ppm of the butoxyethanol ester of 2,4-D, 86% and 85% kills. On the Plumas plot area, on June 18-28, when R. roezli fruits were well formed and rather uniformly about pea size, nearly all tests of chemicals similar to the above resulted in 100% bush kill. Only one or two bushes remained alive on any plot. All of this set of Plumas tests consisted of one-third 2,4-D and two-thirds 2,4,5-T.

TRIETHANOLAMINE
VERSUS SODIUM SALT

PLUMAS PLOTS GAVE
EXCELLENT RESULTS

On July 12, R. roezli fruits on the Sierra plot area averaged about 1/2 inch in diameter. Vigor of the treated R. roezli bushes was fair. Spray plots of this set were located within and on the edge of a dense thicket of wild cherry and ceanothus. The average bush kill for this group, to which no summer oil was added, was 55%. The outstanding success (96% bush kill) resulted from treatment with 1000 ppm each of the butoxyethanol esters of 2,4,5-T and of MCP.

On the Sierra plot area on August 8-10, R. roezli fruits were full sized; some were ripe. Lots of brush, mostly wild cherry and ceanothus, was present on plots treated at this time. Only 2 out of 39 tests of this post-season group gave even a fairly satisfactory kill. One of these plots, treated with 500 ppm butoxyethanol ester of 2,4-D (Weedone LV-4), gave 82% bush kill. The other, treated with 2000 ppm MCP (ACP #904), gave 75% bush kill. Both of these plots received no summer oil. More than one-fourth of August tests on the Sierra resulted in practically no bush kill. In contrast, several late- or post-season plots on the Plumas National Forest, treated on August 22 to 24, resulted in satisfactory bush kills; 1000 ppm of MCP (ACP #904) without summer oil gave 100% bush kill; 3000 and 1500 ppm mixed isopropyl esters of 2,4-D and 2,4,5-T gave 92% and 75% kills; 250 and 1000 ppm butoxyethanol ester of 2,4-D with no summer oil gave 75% and 67% kills; and 1000 and 500 ppm of mixed butoxyethanol esters of 2,4-D and 2,4,5-T, with additions of special emulsifier and 10% Diesel oil, gave 90% and 70% bush kills.

LATE TESTS
WEAK IN SIERRA

Defoliation Tests

In the defoliation tests--the very dilute aqueous tests--of 1950-1952, no added effectiveness seems to have been gained from the addition, to the 2,4-D and 1% summer oil, of 100 ppm ATA (ammonium trichloroacetate) or of 100 ppm NAENDO (disodium 3,6-endoxophthalate). See table 5. Ten of 33 defoliation plots treated with 2,4-D showed 100% bush kill after 1 to 4 treatments.

CHEMICAL TESTS FOR 1952

In 1952, 282 experimental chemical tests were applied to ribes from mid-June to mid-September; 239 of these tests were concerned primarily with *R. roezli*, 28 tests with *R. cereum*, and 15 with *R. montigenum*. Of these 282 tests, 116 were basal stem treatments, 84 were dilute aqueous sprays, 44 were dilute aqueous sprays with added Diesel oil, 12 were suspensions of powder in water (applied as dilute aqueous sprays), 20 were broadcast treatments of pelletized materials, and 6 were very dilute aqueous resprays of defoliation plots previously treated.

MANY TESTS APPLIED IN 1952
New formulations of 2,4-D and 2,4,5-T were compared with standard in the 116 basal stem tests. Three diluents (kerosene, Diesel oil, and a high-aromatic weedkilling oil, i.e., Avon Annalos #11) and four esters (isopropyl, butoxyethanol, propylene glycol butyl ether, and tetrahydrofurfuryl alcohol) were involved in the basal stem tests. These same ester forms of the chemicals were included in the 84 dilute-aqueous tests. Triethanolamine salt of 2,4-D, and the butoxyethanol ester and amine forms of MCP (2-methyl-4-chloro-phenoxyacetic acid), were also tested. A series of amended aqueous sprays had 2.5, 5.0, 7.5, and 10.0% of Diesel oil added to butoxyethanol ester formulations containing special kinds and amounts of emulsifier. The powder-suspension dilute-aqueous tests concerned a wettable powder of 80% CMU, i.e., 3(para-chlorophenyl)-1,1-dimethyl urea. 2,4-D and CMU in special pelletized formulations were

CMU, A SOIL STERILAND TRIED scattered uniformly over plots for the broadcast pellet tests. Only 6 plots of the defoliation series started in 1950 required respraying in 1952.

Preliminary results from June 1952 tests indicate that on the average isopropyl ester and triethanolamine salt formulations in dilute-aqueous sprays did not give as good kills as did other formulations.

Table 5. Results from defoliation (very dilute-aqueous) spray treatments of *Ribes roezli*, 1950-1952.

Forest	Defoliation	Formulation*
Sierra	90% and over	25 or 50 ppm 2,4-D**
Plumas	80% and over	25 ppm each 2,4-D and 2,4,5-T**
Sierra	Less than 25%	100 ppm NAENDO ‡
Plumas	Less than 10%	100 ppm NAENDO ‡

*All tests had 1% summer oil added to spray mixture, and all consisted of 5 gallons applied to a 1-square-rod plot.

**Both with and without 100 ppm ATA or NAENDO.

‡ No 2,4-D in these tests.

Table 6. Comparison of basal-stem treatments and dilute-aqueous sprays on R. roezli, using the isopropyl and butoxyethanol esters of 2,4-D and 2,4,5-T.

Date applied, 1951	Forest	Percentage bush kill						Line means
		Basal stem*			Dilute aqueous**			
		IPE	BOEE	Means	IPE	BOEE	Means	
June 5-10	Sierra	95	98	97	63	81	72	94
June 20-29	Plumas	88	96	92	100	96	98	93
Aug. 8-16	Sierra	71	77	75	23	33	28	70
Aug. 22-30	Plumas	98	91	95	67	51	58	90
Means		89	91	90	59	65	62	87
June only		91	97	95	75	86	80	93
August only		86	83	84	43	44	43	79
Sierra only		84	88	87	45	63	54	83
Plumas only		93	94	93	81	67	73	91

*Average of 3 concentrations (5.0, 2.5, and 1.0% total concentration) of 2,4-D, 2,4,5-T, and half-and-half of each.

**Average of 3 concentrations (1000, 500, 250 ppm 2,4-D). Plumas tests had 2,4,5-T added. All dilute tests had 1% summer oil added.

Table 7. Results from basal-stem treatments of R. roezli. Regular treatment, light (low volume) treatment, and narrow band (thin band) treatment on stems.

Date applied 1951	Forest	Percentage of bush kill. After type of treatment*			Line means
		Regular treatment	(Low vol.)	Narrow band	
June 7	Sierra	100	93	100	98
June 30	Plumas	80	82	96	85
Aug. 28	Sierra	80	69	91	81
Aug. 16	Plumas	94	91	100	93
Means		87	85	97	89
June only		85	85	98	89
Aug. only		89	85	95	89
Sierra only		90	77	95	88
Plumas only		86	87	98	89

*All tests made with 2.5% each 2,4-D and 2,4,5-T isopropyl esters.

Table 8. Comparison of bush kills from dilute-aqueous spray applications of the sodium salt of 2,4-D versus the amine salt; Ribes roezli, Sierra N.F., 1951.

Date applied, 1951	Sodium salt (Monohydrate)				Triethanolamine salt			
	Triplicate tests			Means	Triplicate tests			Means
	1	2	3		1	2	3	
May 23	80	68	50	65	100	82	68	81
June 11	87	43	30	55	100	92	85	92
Aug. 8	63	46	21	44	19	18	6	13
Means	78	55	35	56	69	72	51	63

Table 9. Results from basal-stem and dilute-aqueous spray treatments of R. roezli, in heavy brush and in the open, with the isopropyl ester of 2,4-D.

Date applied, 1951	Forest	Percentage bush kill of <u>R. roezli</u>					
		In dense brush			In the open		
		Basal*	Spray**	Means	Basal*	Spray**	Means
June 6-10	Sierra	90	86	89	96	67	91
June 28-30	Plumas	79	100	82	84	100	85
Aug. 9-15	Sierra	54	44	53	66	18	59
Aug. 22-28	Plumas	77	31	67	98	75	96
Means		76	63	74	87	61	84
June only		84	92	85	90	76	88
August only		67	34	61	84	41	79
Sierra only		73	73	73	83	48	77
Plumas only		78	56	74	92	86	91

*Averages of 3 concentrations (5.0, 2.5, and 1.0%) of basal-stem treatments.

**Dilute-aqueous spray tests made with 500 ppm 2,4-D plus 1% summer oil.

SECTION IV. DISEASE STUDIES IN OREGON AND CALIFORNIA

Significance of Rust Spread - Scouting in 1952.

Scouting for white pine blister rust during the summer and fall of 1952, revealed that there was no long-distance spread of the disease from aeciospores produced at northern sources to ribes growing at the fringe and beyond the known infection zone.

NO SIGNIFICANT LONG SPREAD FROM PINE TO RIBES

Climatic conditions during the spring appeared to be extremely favorable for rust development on ribes. The rust appeared early on the leaves of bushes growing in southern Oregon and northern California. A few telia were found during the latter part of June.

Rust on ribes bushes growing in the Sierra Nevada began to appear in July. By midsummer rusted bushes were common to numerous at those areas highly favorable to rust incidence and development from the northern end of the Stanislaus N.F. northward in the Sierras and Cascades. No rusted bushes were found south of the Stanislaus N.F. In the Coast Range sugar pine belt, rusted bushes were numerous from the southern end of the Trinity N.F. northward. A few rusted bushes were found on the Mendocino N. F.

The rust on ribes continued to intensify on the leaves throughout the summer. In most areas this intensification was as great as it had been in 1944, and at local areas it was even heavier, as the following noteworthy examples will show.

UNUSUALLY HEAVY RUST ON RIBES

The leaves of R. bracteosum growing along some of the streams on the Siskiyou and Klamath National Forests were so heavily rusted that they were curling and drying during early September. A similar intensity of infection was observed for leaves of R. sanguineum. Often the leaves of entire bushes of R. lobbi would be almost completely covered with rust. At Shovel Creek on the Shasta N.F. the leaves of R. petiolare were so heavily rusted that they were curling and dropping during early September. Ten ribes species, including bushes of R. velutinum, were found infected in this area. In a recently cut-cover area at Beanville Meadows, Eldorado N.F., that supported abundant young ribes bushes, more than half of the bushes were rusted. Heavy rust was noted on large succulent leaves of a shade form of R. cereum growing under infected R. roezli. Most of the rusted leaves of R. cereum had telia on both upper and lower leaf surface, an unusual development even for ribes species that are much more susceptible than R. cereum.

Rust samples on ribes were collected from every area where rust was found with the exception of southern Oregon where blister rust is so prevalent that differentiation between pinyon and blister rust as a general procedure serves no useful purpose. A few samples, however, were collected from the Siskiyou N.F. and submitted for determination.

Of 1,161 samples of rust on ribes submitted for determination only 17 were identified as blister rust. It was not possible to identify the rust on 52 samples as some had not yet produced telia, some had all the telia germinated, and the rest had the telia parasitized. This left 1,092 samples as being identified as pinyon rust. The 3 samples collected on the Siskiyou N.F.--6 from the Six Rivers N.F., and 59 from the Trinity N.F.--were all identified as pinyon rust. Only 1 of 39 samples submitted from the Shasta N.F. was determined to be blister rust. From these results it appears that nearly all of the rust on ribes was due to pinyon rust.

RUST IDENTIFICATION STILL A PROBLEM

Extensive damage has already occurred to young white pine in highly favorable rust spots of southern Oregon and northern California especially on areas outside of control units. This damage is now becoming notable in pole size and even in young mature trees in the more hazardous sites. By contrast the build-up of rust in the Sierra Nevada continues to be slow although some new cankers are appearing in pine infection centers both inside and outside present control units. Cankers of 1950 origin were found this year on a previously known infection center (outside the control unit) near the southern end of the Eldorado N.F.

Two sugar pine trees that appear to be highly rust resistant were located beside Shovel Creek on the Shasta N.F. Other trees of this category previously located were examined and again no cankers were found.

The following tabulation shows the southward spread of white pine blister rust in California by years.

Year	Spread in miles from Oregon border by area by host			
	Sierra Nevada		Coast Range	
	Sugar pine	Ribes	Sugar pine	Ribes
1936	--	--	4	6
1937	--	120	4	125
1938	--	160	4	125
1939	--	160	14	125
1940	107	160	42	125
1941	165	160	42	200
1942	165	175	42	210
1943	165	175	115	265
1944	165	240	115	265
1945	165	240	115	265
1946	204	240	121	265
1947	212	240	121	310
1948	212	240	121	310
1949	224	240	121	310
1950	231	240	121	310
1951	244	244	121	310
1952	244	244	121	310

Disease Survey - 1952

Disease survey studies were continued in 1952. Emphasis was placed on securing more pine infection data on the 189-acre Mill Creek plot, which is situated on the northern end of the Rogue River N.F. near Prospect, Oregon. This plot was designed to determine:

1. The amount of pine infection resulting from a given amount of live stem of Ribes sanguineum.
2. The distance that infection will spread from R. sanguineum to sugar pine under the conditions that exist at the Mill Creek area.

A camp consisting of 7 field men, a camp boss, and a cook was established in early June and operated into the first week of September.

**R. SANGUINEUM
A TROUBLESONE HOST** During this time the crew surveyed and took data on two 8-spoke wheels, one 5-spoke wheel, and one 3-spoke wheel. The hub of each wheel was centered at a ribes bush or clump of bushes. Each spoke in each wheel was 1/2-chain wide and 20 chains long. These were divided into 40 transects with each

transect 1/2-chain on a side and containing 1/4-square chain of area.

In addition to the wheels, the crew surveyed out and took data on 800 1/4-square-chain plots in a randomized sample of 189-acre plot. This is about a 10% sample of the larger plot.

Each young sugar pine tree (trees less than 20 feet in height) on each plot or transect was classified as to height and crown-class group and then it was examined for blister rust cankers. All data were coded and recorded in such manner that they could be transferred to punch cards for the compilation by the International Business Machine. Of the 21,925 trees examined on all the plots 3,271 or 14.9% were found to be infected.

The data are in the process of being analyzed statistically. Charts, maps, and graphs needed to present the results are being prepared. The final results will be presented in a special report.

In addition to the work at the Mill Creek plot the status of the other 15 one-acre plots was reviewed. Those scheduled for protective treatment in 1952 were inspected before the treatment to determine the number of ribes bushes and the amount of live stem present. The plots were again checked after the treatment or will be checked early in 1953 to determine the amount of live stem remaining on the ground. This procedure gives a complete case history of each plot.

FISCAL YEAR ALLOTMENTS FROM WHICH EXPENDITURES
WERE MADE BY THE DEVELOPMENT AND IMPROVEMENT PROJECT
DURING THE CALENDAR YEAR 1952

Federal Funds

Fiscal Year 1952	Fiscal Year 1953
\$46,500	\$53,600

Expenditures by the Development and
Improvement Project for the Calendar Year 1952

Fiscal Year 1952 1/1 to 6/30/52	Fiscal Year 1953 7/1 to 12/31/52	Total
\$27,893	\$28,004	\$55,897 *

*Expenditure distribution by states

California	\$22,359
Idaho	16,769
Montana	2,795
Oregon	5,590
Washington	<u>8,384</u>
Total	\$55,897

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